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ABSTRACT

In 1990, a longitudinal study was conducted of enrollments, student demographics, and educational outcomes of Prince George's Community College's (PGCC's) nursing program. Using state and institutional data, the study revealed that: (1) nursing enrollment and nursing course credit hour totals were among the six highest of PGCC's more than 30 instructional programs and curricula, and were continuing to grow while college enrollment and credit hour generation were experiencing an overall decline; (2) compared to PGCC's student body as a whole, the nursing program's enrolled a disproportionate number of females, older and married students, and foreign and non-white students; (3) 70% of the nursing students were minority group members, making PGCC's program unique among Maryland community college nursing programs in terms of a "majority minority" enrollment; (4) in recent years, nearly all of the nursing students attended on a part-time basis; (5) nursing students achieved higher grades and retention rates than the PGCC student body as a whole; (6) 50% of all students since 1968 who were officially recorded as "nursing majors" never attempted a single nursing course; (7) the program's graduation rate declined year to year since 1980; and (8) PGCC nursing students consistently had lower first-time pass rates on the state's licensing exam than other schools, dropping 20 points to a low of 68% in 1988-89. (AYC)

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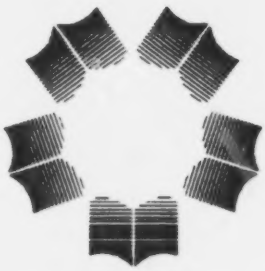
PROGRAM EVALUATION

NURSING PROGRAM STUDENTS AND ACADEMIC OUTCOMES:

COURSE-TAKING, GRADUATION AND LICENSURE 1968-1989

Karl Boughan



PRINCE GEORGE'S
COMMUNITY COLLEGE

Program Evaluation PE90-5

prepared by the

Office of Institutional Research and Analysis

March 1990

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PRINCE GEORGE'S COMMUNITY COLLEGE
Office of Institutional Research and Annalysis

NURSING PROGRAM STUDENTS AND ACADEMIC OUTCOMES: COURSE-TAKING, GRADUATION AND LICENSURE 1968-1989

Program Evaluation Report PE90-5

Introduction

Nursing has always been an attractive career option for community college students. Currently, more than 185,000 students are enrolled in 1,450 nursing programs in the United States, 55 percent of which are pursuing Associate of Arts in Nursing degrees. Not only does nursing offer professional status, relatively good income and the opportunity to make a vital contribution to society, but it also provides fairly ready access to graduates of two-year degree programs. Recently, its attractiveness has been enhanced even more by what amounts to an explosion of the nursing job market. Lately, fewer Bachelor of Science in Nursing graduates are being produced by four-year institutions, a reflection of the nursing profession's waning ability to compete with the remuneration and prestige offered today's young women by many career paths formerly open only to men. Also within the last dacade, dramatic structural changes in the nation's medical delivery system has had a discouraging impact on the recruitment and retention of all health health professionals, nurses included. As a consequence of both trends, a very wide "nursing gap" has been opened up country-wide, which also can be seen in effect locally. A summary article in recent Washington Post job market review devoted entirely to health career opportunities [Welch/1989, p. 335; see Appendix for full citations] estimated a national short-fall of nursing graduates of 257,000 by 1990, with the Greater Washington area experiencing its proportionate share.

Prince George's Community College has always recognized the important career path potential nursing held for its occupation-seeking students, and has over the years built up the single largest two-year nursing program in Maryland in terms of credit enrollment. It has also, of course, strived to match quantity with quality, as much more difficult goal to accomplish and track.

This report will discuss the findings of an detailed OIRA study of all PGCC nursing students 1968-1989, focusing on the issue of the quality of the performance of the College's Nursing Program in moving its charges from declaration of nursing major through to the passing of the registered nursing licensure examination. The study is unprecedented in the scope of time span covered, number of students included and in the amount of effort expended to create the most accurate, realistic program outcome measures possible.

Basic Facts: Curriculum, Facilities and Faculty

The PGCC Nursing Program, located within the Allied Health Technologies Division which also provides instruction in radiography, respiratory therapy, nuclear medicine, medical records technology and physical therapy, offers students a curriculum of instruction leading to a Nursing Associate of Arts diploma. Would-be nursing students first declare their choice of the nursing curriculum to the Registrar's Office, at which point they are considered nursing "petitioners" by the Department of Nursing. A student remains a petitioner until she meets certain elementary criteria required by all entering occupational programs (including remedial academic course work). Once official, the nursing major follows a basic six course sequence beginning with Nursing 151 (Principles and Practices of Nursing I) and ending with a practicum (Nursing 265); at present, no structured field experience is included in the program. The basic nursing sequence is augmented by a least one required course in biology (Biology 105, Human Anatomy and Physiology I, also considered a nursing entry course), one in mathematics, plus course work in English, Speech, psychology and sociology. A total of 69 credit hours must be accumulated for graduation, the nursing portion of which must represent course work completed with examination scores of at least 70 in a grading system of 0-100. Graduating students are expected to go on to take National Council Licensure Examinations towards Registered Nurse certification (NCLEX-RN), and from thence either directly into the medical job market or on into an advanced nursing program at a four-year institution.

Currently, the Nursing Department has a full-time faculty compliment of thirteen, all of which are Registered Nurses holding Masters degrees; one faculty member also holds a Ph.D. Class sizes are intentionally kept moderate (faculty/student ratio 1:30 as of Fall 1989) to give course enrollees good access to instructors and equipment and to permit instructors to give as much personal attention to the progress and needs of each student as possible. In addition, regular one-on-one academic counselling is a feature of the program. Classrooms and laboratories are well-equipped with up-to-date instruments of nursing technology, and because of the scope of the entire Allied Health Technologies Division nursing students also have opportunities for exposure to the medical and health technologies and practices of cognate disciplines.

Basic Facts: Current Enrollment and Growth

As in other recent years, analysis of PGCC's Fall 1989 credit student enrollment showed the Nursing Program to be one of the colleges largest, most active and fastest growing. With 752 students opting for the nursing curriculum out of a total 13,381, Nursing Program enrollment constitutes 5.7 percent of all credit enrollment, and ranks sixth in size among the College's 32

instructional programs (fourth among its 26 occupational programs). Similarly, the number of course credit hours generated by nursing majors (6,333) ranks very high compared with that produced by all other program major groups -- seventh (average per program, 3,074).

Even more striking, however, is the recent growth spurt exhibited by the nursing major component of total credit enrollment. The low ebb of Nursing Program enrollment occurred in Fall 1987 (544 majors, 4.2 percent of all credit students). By Fall 1988, it had recovered by +14.9 percent (625 majors) while general enrollment gained only 4.4 percent. Then, while total enrollment Fall 1988-89 registered a -.5 percent decline (13,443 to 13,381), nursing majors surged ahead 20.3 percent (625 to 752)!

These raw headcount growth trends have also been paralleled by development in other areas. For example, the increase in nursing major credit hours generated between the last two fall registrations was quite as impressive -- 17.0 percent (5,413 to 6,333), especially in comparison to the two percent drop experienced in total credit course hours. And during this interval, nursing course credit hours went up as well -- from 1,703 to 1,831 (7.5 percent).

TABLE 1. PEER INSTITUTION COMPARISON OF PRINCE GEORGE'S COMMUNITY COLLEGE FALL 1988 NURSING PROGRAM ENROLLMENT

	% College Enrllmt	% State Enrllmt	Nursing Enrllmt	Total Enrllmt
Allegany	16.5	9.0	(345)	(2,220)
Cecil	9.5	3.6	(138)	(1,447)
Howard	6.5	6.7	(256)	(3,925)
Harford	6.1	7.1	(272)	(4,454)
Essex	4.7	12.5	(477)	(10,218)
Frederick	4.7	4.3	(163)	(3,470)
PGCC	4.6	16.4	(625)	(13,441)
Anne Arundel	4.4	13.5	(516)	(11,664)
Catonsville	4.2	12.7	(485)	(11,444)
Baltimore	4.2	4.9	(188)	(4,487)
Wor-Wic Tech	4.2	1.1	(43)	(1,032)
Hagerstown	2.2	1.5	(57)	(2,641)
Charles	1.3	1.7	(64)	(4,966)
Montgomery	.9	4.8	(184)	(21,565)
ALL SCHOOLS	3.7	100.0	(3,813)	(103,041)

Sources: State Board of Community Colleges, Program Data Monitoring System Report 1988; 1988 Databook

PGCC Nursing Program weight, however, should be placed within the larger state context to be fully appreciated. Table 1 above displays figures on nursing program enrollment for PGCC and its thirteen Maryland peer institutions, for the latest available data -- Fall 1988. Even before its substantial numerical upswing in 1989, PGCC's nursing program is shown as having the single largest community college nursing major headcount in the state, representing almost one of every six nursing majors enrolled at state two-year institutions (16.4 percent). Furthermore, PGCC's percent nursing enrollment against total college enrollment of 4.6 (Fall 1988) well exceeded the all-peer institution major vs. total enrollment percentage of 3.7. It must be added, however, that six other community colleges outstripped Prince George's in nursing major proportions of total college enrollment. For example, first ranked Allegany Community College claimed that about one in six of its enrollees (16.5 percent) was following a nursing A.A. curriculum. On the other hand, another look at Table 1 indicates that the top four colleges according to nursing major enrollment proportion, including Allegany, are all relatively small institutions (under 5,000 students) while the next five, including PGCC, are with one exception large institutions with fall enrollments averaging over 10,000 students. It would seem that the more comprehensive curricular range which larger institutions offer students mostly accounts for their somewhat smaller proportions of nursing majors.

Nursing Students at PGCC: What are They, Who are They?

At first blush, it might seem that the definition of a nursing student is non-problematical: nursing student = nursing major, what else? But deeper analysis reveals that answering the question of what constitutes genuine pursuit of a course of nursing study within a community college context is anything but simple.

Essentially, the problem is this: Prince George's Community College, not atypical in this regard, is an open-enrollment school which accepts students of widely differing levels of collegiate readiness, clarity of personal goals and occupational commitment. This means relatively easy access to occupational instruction programs but also many problems in maintaining and tracking retention -- especially when it comes to more academically demanding programs like Nursing. In other words, not all who may sign up for a program are serious, not all who may be serious are in an academic or personal position to stick it out, and not all who may attempt to stick it out can afford to do so in the conventional two-years straight-through style. When one adds to all this a "student-friendly" academic status tracking system which leaves registering changes in program major up to the students themselves, one begins to see the real dimensions of the analysis problem. Since the core of any instructional program evaluation is a program outcome analysis (student success in terms of

graduation rates, etc.), and since the results of any outcome analysis is so dependent upon how students-in-the-program is defined, this report will utilize and assess several different concepts of "nursing student", some standard and some innovative, in order to gain the most realistic picture possible of how well PGCC's nursing program has been performing.

Who are the Nursing Majors? The "nursing major" concept of nursing student is first for review. Table 2 below displays the demographic and academic category percentage break-downs for all PGCC fall enrollees (1985-1989) who in their most recent move to inform the Registrar's Office of study subject preference indicated "nursing" as their curriculum choice. (Figures in parentheses are ratios of category nursing percentages to corresponding total enrollment percentages, and thus indicate comparative nursing disproportions.)

TABLE 2. PGCC NURSING MAJORS BY DEMOGRAPHIC AND ACADEMIC CATEGORIES - FALL ENROLLMENTS 1985-1989*

	1989		1988		1987		1986		1985	
Female	93	(1.49)	94	(1.53)	94	(1.52)	95	(1.54)	93	(1.54)
Male	8	(.20)	6	(.16)	6	(.17)	6	(.14)	7	(.17)
White	32	(.69)	35	(.72)	40	(.77)	45	(.83)	50	(.89)
Black	59	(1.26)	59	(1.32)	53	(1.28)	49	(1.24)	45	(1.18)
Other	9	(1.25)	6	(.94)	7	(1.06)	7	(.99)	6	(.89)
< 21	24	(.71)	24	(.69)	27	(.76)	34	(.85)	28	(.84)
21-25	25	(1.07)	25	(1.08)	25	(1.09)	24	(1.15)	29	(1.17)
26-35	30	(1.31)	32	(1.40)	31	(1.41)	26	(1.24)	29	(1.24)
36-60	21	(1.24)	19	(1.13)	16	(1.00)	15	(1.01)	14	(.89)
> 60	-	(.00)	-	(.00)	*	(.07)	-	(.00)	-	(.00)
Single	65	(.88)	67	(.92)	68	(.93)	68	(.94)	67	(.94)
Married	35	(1.32)	33	(1.23)	32	(1.19)	32	(1.16)	34	(1.16)
US Cit	86	(.91)	88	(.93)	91	(.96)	92	(.98)	92	(.97)
Non-Cit	14	(2.31)	12	(2.08)	9	(1.67)	8	(1.40)	8	(1.44)
Fltime	22	(.88)	28	(1.01)	30	(1.07)	26	(.95)	28	(1.02)
Prttime	78	(1.04)	73	(1.00)	70	(.97)	74	(1.02)	73	(.99)
New	16	(.72)	21	(.89)	18	(.66)	17	(.67)	15	(.60)
Cont.	58	(1.22)	58	(1.26)	63	(1.35)	66	(1.39)	68	(1.39)
Trnsfer	13	(1.11)	10	(.85)	7	(.77)	6	(.60)	6	(.72)
Readmit	12	(.69)	11	(.59)	12	(.70)	11	(.62)	11	(.62)
NO/%ENRL	752	[5.6]	625	[4.6]	544	[4.2]	561	[4.5]	677	[5.3]

Looking first at the 1989 column, we notice above all the extreme disproportion of women students among nursing majors (93 percent) which is the reason why "she" and "her" are used in this evaluation when pronominal terms are called for. In the entire student body, women are disproportionately represented (62 percent) but traditional occupational gender-linkage here produces a subset of students who are almost 50 percent more female than the whole (ratio 1.49).

Although the sex imbalance is not surprising, what might be considered so is the large majority of non-whites (68 percent; black 59 percent) among PGCC nursing majors. This stands out against state nursing student statistics which show blacks and other non-whites as a small minority of all currently pursuing nursing A.A.s and B.S.s. To some degree this disproportion reflects the unique overall character of the PGCC credit student body (54 percent non-white) and surrounding county (51 percent non-white), but not entirely since the non-white nursing major rate significantly exceeds even these levels (non-white ratio 1.25). PGCC nursing majors also show another ethnic distinction -- they are well over twice as likely to be non-citizens (ratio 2.31) than students on average. Even so, non-citizen nursing majors constitute only a very small minority component of this group (14 percent). Another departure from the norm is nursing student age distribution, which is mildly but definitely skewed to the upper end: Age 26-35 ratio -- 1.31; Age 36-60 ratio -- 1.24. However, in straight percentage terms Under-26-Year-Olds still make up almost half of all nursing majors (49 percent). A related finding of Table 1 is the disproportion of married nursing majors (ratio 1.32).

In academic terms, the average nursing major is a bit less likely to be studying full-time than the randomly selected student (ratio .88), tends less to be a newcomer to college and to PGCC (ratio .72), and more to be a transfer in from some other higher educational institution (ratio 1.11). Most outstandingly, however, is the likelihood that she will be a hold-over from a previous semester. Continuing students make up 58 percent of Fall 1989's crop of nursing majors, a proportion well above the norm (ratio 1.22).

The nursing major demographic and academic profile just sketched seems to be one quite stable or only slightly altering over time, with one exception. Table 2 shows no discernable trends from Fall Enrollment 1985 to Fall Enrollment 1989 for gender and marriage status whatever, and no real change in the proportion of full-time students until the last term considered. Snail's pace increases over time seem to be registering for the proportion of students aged over 26 years and foreign majors, while gradually the percentage of continuing nursing majors has dropped from 68 to 58 percent. The dramatic exception is racial balance. The proportion of white students registered in the nursing curriculum has been

slipping roughly 4.5 points with each fall enrollment, plummeting from 50 percent in 1985 to only 32 percent most recently.

But there are important clarity of interpretation problems associated with judging category proportions and shifts when the data analyzed is term-enrollment based. Most crucially, veteran students whose original enrollment dates cover a large span of the College's history and first-timers are all lumped together at each term enrollment data point. What one gets, therefore, is a sort of muddy moving average of the category proportions of a motley group consisting of those students left over from a score of "entry classes," when what one really wants are the demographic/academic profiles of the successive entry classes themselves. This is just what Table 3 below provides.

TABLE 3. PGCC NURSING MAJORS BY DEMOGRAPHIC AND ACADEMIC CATEGORIES - ENTERING CLASS YEARS 1967-1989

	Sumr 1989	1988	1987	1986	1985	1980 -84	1967 -79	ALL YEARS
Female	84	94	92	93	89	93	92	92
Male	17	7	8	7	11	8	8	8
White	30	29	36	33	42	49	68	55
Black	56	63	57	61	50	45	29	40
Other	14	8	7	6	8	5	3	5
Under 21*	14	32	32	47	48	41	41	40
21-25	29	24	21	21	22	22	23	23
26-35	34	28	31	22	21	26	26	26
36-60	24	17	16	10	9	11	10	12
Over 60	-	-	-	-	-	<.5	<.5	<.5
Single	54	69	63	72	70	65	51	59
Married	46	31	37	29	30	35	49	41
US Citizen	82	85	87	90	91	94	97	94
Non-Citizen	18	15	13	10	9	6	3	6
Fulltime**	0	3	6	11	11	11	29	18
Parttime	100	97	94	89	89	89	71	82
Oth College***	75	40	39	35	39	38	43	41
PGCC Only	25	60	62	65	61	62	58	59
[HEADCOUNT]	[115]	[324]	[231]	[207]	[231]	[1616]	[2473]	[5197]

* Age as of entering term ** During last term's attendance
*** Whether previous to PGCC or intermittant

Whereas Table 2 was based upon several independent data sets (one per each fall term 1985-89), Table 3 is established upon a single data file called TAB, which contains unduplicated observations on every credit course-taking PGCC student virtually from the beginning of this institution down to the term (Summer II 1989) just preceding the present one (Fall 1989). From this immense set, a sub-set was selected for analysis consisting of all nursing majors from Summer I 1968 term onwards. These were then grouped into five "entering class years" (all students whose original terms of attendance fell within a single Summer I/II/Fall/Spring academic year), plus two longer period groups representing pre-1985 entrants. (It should be noted that "1989" is an immature entry year covering Summer terms I and II only, and therefore should be interpreted with caution.)

Comparing Table 3 to its predecessor we observe largely the same basic patterns of distribution across categories and over time but often in a more emphatic form. In particular, the racial effect appears much more pronounced. The last two entry classes exhibit a white minority of considerably less than one-third of all nursing majors, down from about two-fifths (42 percent) in the 1985 entry class. The extent of this decline is even more impressive when pre-1985 data is considered: almost half of 1980-84 entering nursing majors were white (49 percent), and over two-thirds were in the pre-1980 period (68 percent). Also, the upward trend in proportions of students from outside the U.S. seems sharper (9 percent in 1985, 18 percent in 1989), as does the decline in the numbers of younger nursing majors (48 percent in 1985, 32 percent in 1988, and with the caveat mentioned above 14 percent in 1989).

But perhaps the single most noteworthy trend detected in Table 3 has to do with full-time/part-time status. It would appear that once the "carry-over" effect of Table 2 is eliminated what emerges is a picture of the almost wholesale abandonment of full-time study by more recent nursing major entrants: since 1987, fewer than 5 percent of entering nursing majors can be called full-timers, a statistic unchanged even when students taking non-counting developmental courses are removed from the analysis. A partial explanation, however, may be the sharp revision in student counselling policy adopted by the nursing faculty in 1987. In the last three years students have been strongly advised to limit credit hours in their initial and final terms to minimize academic stress at the start and allow for post-graduate preparations at the finish.

"Studying" Nursing Majors: What are They, Who are They?

One of the peculiarities of PGCC's student tracking system is that registering changes in curriculum pursued is entirely up to the students themselves. Students who objectively switch from one course of study to another without informing the Registrar's

Office will continue to be recorded as "majors" in the original subject -- even if they achieve A.A. degrees or certificates in the second or some subsequent subject. This chance for misclassification is usually discounted in the College's research because it is assumed that discrepancies of this sort occur extremely infrequently. Such an assumption, however, may be very dangerous in the case of students initially pursuing the College's more academically demanding instructional programs, such as Nursing, where one might expect a higher than usual rate of drop-out among the less gifted or motivated.

In order to guard against the inclusion of "pseudo-majors" in our analysis, a strategy was devised to isolate them in advance. The strategy called for defining pseudo-majors in terms of objective course-taking and program completion criteria. Logically, any student on record as a nursing major who had never attempted even one entry-level nursing course (NUR 151 or BIO 105) before her last known term at PGCC is a prime candidate for the pseudo-major title, or at very least the title "Unbegun Major." Also, there may appear a residual group of recorded nursing majors who while still without nursing course entry have not yet left off attendance at PGCC. These can be termed "Pending Majors."

Then, to follow the logic through, recorded nursing majors who have attempted at least one entry-level course can be considered "real" or "studying" nursing majors. Meeting this positive criterion does not, of course, guarantee that a studying major has actually passed her entry course let alone gone on to success in the nursing program. But it does separate off if rather liberally those nursing majors who are now or have in the past been genuinely "in-the-program."

Table 4 (p. 11) displays the demography and academic category distributions for all 2,815 studying nursing majors attending PGCC at some point since 1968. The Table's columns represent study class year sub-sets, analogous to the entry class years of Table 3, the main difference being that "entry" in this case means entry upon nursing study (the timing of the first entry-level nursing course attempt), not entry upon general study (the timing of first attendance at PGCC) -- although, of course, in a few instances a student nurse's entry and study class years may turn out to be identical. Also, since the studying major group by definition has some level of academic experience it seems appropriate at this point to introduce in Table 4 four course performance variables not previously utilized -- Duration of Nursing Study, General Grade Point Average, GPA for nursing courses only, and Developmental Course-taking. (The two GPA measures are expressed here as if letter grades rather than average numerical scores to facilitate interpretation. Study Duration counts the number of terms -- four per year -- passed from the first term of nursing study (entry course attempt) through to the last term of attendance.)

The first point to be grasped from Table 4, before any discussion of category distributions, is global -- only 2,815 of our 1968-1989 set of 5,241 PGCC nursing majors qualify as studying majors (54 percent)! Almost half of all nursing majors in our sample prove to be "unbegun." A handful (under 3 percent) are still "pending," but most are those who left PGCC before even trying to get into the nursing program beyond stating a major.

This need not necessarily be taken as an indication of the weakness of nursing as a study at PGCC, either absolutely or relatively. No one really knows how much normal undeclared shifting around of area of study exists at PGCC. And more importantly it is only to be expected that a demanding, quality professional program will daunt many, which is as it should be. Nursing is serious business. Much of the shock value of this finding comes from its unexpectedness. Standard analysis has never looked for this phenomenon before, so naturally it never found it. But it may have been operative all along -- and not just at Prince George's Community College but at our peer institutions and others offering nursing programs as well.

Also, while the finding deflates our sense of the size of PGCC's nursing program, it works in reverse on our sense of the success of the program. One might argue that the number of genuine students of nursing -- those truly in the program -- ought to be the denominator of all realistic formulas measuring program performance, not merely the number of declared nursing majors. Thus the finding -- truthfully -- tends roughly to double our success ratings.

But the finding should give us some qualms as well. "Unbegun" majors, after all, did express enough early interest in nursing as a career to take the first step -- inform educational authorities of their intentions to study. Some, perhaps many, had they taken the second step of beginning course work, might have gone on to graduate and become credits to the profession. Is the high number of "unbegun" majors at PGCC an indication of an access problem in the program? Maintaining both high standards and fair access is always an agonizing balancing act. In growing recognition of the importance of the latter the Nursing Division has within the last few years undertaken several projects to enhance access and encourage retention -- for example, the Nursing Educational Preparation Program (or NEPP). The proportion of "unbegun" nursing majors suggests that such efforts should be strengthened and broadened, and that more research be carried out in support of them and in an attempt to identify more clearly the nature and implications of the "unbegun" phenomenon.

TABLE 4. PGCC STUDYING NURSING MAJORS BY DEMOGRAPHIC AND ACADEMIC CATEGORIES - STUDY CLASS YEARS 1968-89*

	1988	1987	1986	1985	1980 -84	1967 -79	ALL YEARS
Male	10	8	5	6	8	7	7
White	37	49	51	56	66	78	68
Black	55	45	45	36	29	19	28
Other	8	6	4	8	5	3	5
Under 21	32	38	48	46	45	40	41
21-25	26	22	15	21	19	22	21
26-35	29	31	26	23	26	26	27
36-60	14	9	11	10	10	12	11
Over 60	-	-	-	-	-	<.5	<.5
Married	41	38	34	30	37	52	44
Non-Citizen	16	7	4	7	4	3	5
Fulltime (1)	3	12	19	20	17	47	30
<1Yr Study (2)	70	9	8	8	6	5	10
1 - <2 Yrs	30	78	23	35	25	36	36
2 - <3 Yrs	-	13	67	37	40	37	36
3 - <4 Yrs	-	-	2	18	13	9	9
4 Ys Plus	-	-	-	2	15	13	11
Oth College (3)	61	46	43	46	46	47	48
All Crs: A/B (4)	17	24	19	25	25	31	27
All Crs: C	59	57	61	59	58	58	57
All Crs: D	15	13	16	11	13	7	10
All Crs: D-/F	10	6	4	5	5	4	5
Nur Crs: A/B (5)	21	32	26	30	25	37	32
Nur Crs: C	54	46	53	58	57	53	54
Nur Crs: D	19	18	16	10	15	8	11
Nur Crs: D-/F	6	4	5	2	3	2	3
No Pass Grde (6)	57	33	31	20	25	16	24
Dev Crs: 1+ (7)	29	34	39	34	33	23	28
[HEADCOUNT	[175]	[140]	[137]	[119]	[820]	[1384]	[2815]

* Too few in 1989 to percentage 1-Last Registered Term Only
2-First Nurs. Course to Last Term 3-Any Non-PGCC Experience
4-All Courses GPA (Letter Grade Equivalents B=3.0/C=2.0/D=1.0)
5-All-Nursing Courses GPA 6- At least 1 Nursing Course
7-Students with at least 1 Developmental Course attempted

As to the category distributions themselves, for the common variables Table 4 by and large repeats the patterns by now familiar from Tables 2 and 3: extreme under-representation of males, significant drop off of students under age 26, increase in the proportion of marrieds since 1985, sustained growth of the non-white segment into a strong majority along with recent discernable influxes of overseas students, disappearing full-time study and sudden important jump in the percentage of students with non-PGCC experience within the last few years.

But the new course work-based variables deepen the picture. Student nurse general academic performance compares well with that of all credit students 1968-1989. Overall, studying nursing majors registered an all-courses grade point average equivalent to about a C+ (2.49); the corresponding general student GPA was 2.05. The spread of studying major course performance, expressed in GPA intervals set to letter grades, centered on the median C-range (57 percent), while over a quarter averaged A or B grades (27 percent); only 5 percent tended to receive course grades in the failure range. Furthermore, this distribution has remained relatively stable through the years and up to the present.

The variable measuring nursing course performance, besides being based exclusively on nursing course grades, varies somewhat from the computational strategy of general GPA. The intent in designing this variable was to gauge fundamental academic ability in dealing with the substantive content of nursing courses, apart from qualities like willingness to work hard and perseverance. Many students manage after several attempts to achieve respectable passing grades in challenging courses, but only the most talented do so on their initial effort. Therefore, cumulative nursing GPA here reflects only <u>first received</u> letter grades F through A. In addition, we should mention that only grades in NUR-prefixed courses were included in the calculation; though other courses -- for example, those in biology -- are relevant to the nursing program, they were considered less central to the measurement of essential nursing talent. Finally, Table 4 provides a fifth category (No Passing Grade) which requires explanation. "No Passing Grade" was calculated apart from the regular F-A percentages, and includes all studying nursing majors who to date have received no grade other than F or who have gotten only non-counting results from course attempts (e.g., "withdraw"). The purpose here was to isolate and fix the proportion of <u>studying</u> majors who were essentially stalled or balked in their program progress by the height of the academic hurdles with which they were confronted.

The mean nursing GPA turns out to be very close to the general GPA for studying nursing majors 1968-89 -- 2.51 to 2.49, respectively, as are the comparable grade interval distributions. As before, the median category was C (54 percent) with 32 percent

at the B/A and 3 percent at the F/D- extremes. This is a little surprising because one might have expected either a significantly higher general GPA (suggesting the greater difficulty of a concentrated professional program) or a discernably higher nursing GPA (suggesting greater interest and motivation).

But by far the most interesting finding has to do with the percentage of student nurses who occupy the No Passing Grade category. Over the years, almost one in four (24 percent) qualified as a balked major, a nursing student who simply could not get through her entry-level courses. Furthermore, this percentage seems to be slowly growing -- from 16 percent for the 1968-79 period to 33 percent for the 1987 study class. (The 57 percent figure for 1988 is unreliable as an estimator of the balked effect, since many in this late entry class are likely to be still in the process of acquiring their first counting nursing grades.)

The segment of all nursing majors (Unbegun as well as Studying) who found it necessary or desirable to take at least one developmental course accounted for 39 percent of the whole. This figure is quite high compared with all students of whatever major over the years being considered (22 percent), and demonstrates the existence of a relative lack of academic preparedness working against those who come to PGCC to study nursing. Table 4 shows that even though nursing majors who manage to begin taking nursing course tend to be the somewhat more academically fit among all nursing majors, still almost one in three (28 percent) labors against some serious deficiency in mathematics, English usage or reading ability. On the positive side, the table data give no real indication that the proportion of developmental course-takers is increasing with each study class.

Finally, Table 4 allows us to gauge nursing study duration -- the number of terms and years once nursing course-taking begins before either graduation, other PGCC attendance termination, or up to the present in the case of continuing students. About 10 percent (all studying majors 1968-89) were or have been in nursing course study for less than one year; about the same proportion (11 percent) fell into the other extreme -- study duration of four or more years. The median intervals were 1-2 and 2-3 years (36 percent each). In raw mean duration terms, the hypothetical average studying major spent 2.07 years pursuing PGCC's nursing program (one year = four possible terms set at .25 each). Naturally, part-time students tend to take longer than do full-timers, but interestingly the difference in mean duration is not that great -- 2.14 to 1.90, respectively. The explanation for the relative smallness of the gap can be grasped easily from the following interval data:

	Full-time	Part-time
Less than 1 Year	7 %	24 %
1 up to 2 Years	46 %	24 %
2 up to 3 Years	39 %	30 %
3 up to 4 Years	5 %	10 %
4 or more Years	3 %	12 %

Unsurprisingly, very few full-time studying majors (8 percent) spent over three years in PGCC's nursing program while 22 percent of the part-timers did. But counter-intuitively, over three times as many part-timers as full-timers left the program before four terms were up (24 to 7 percent). It would seem that the principle cause of restricted study -- time scarcity and personal pressures -- also works to short-circuit the nursing program careers of a large minority of part-timers, perhaps a quarter of them.

Nursing Program Outcomes: Academic Success Measures 1968-1989

There are many ways of conceptualizing and measuring occupational program "success." First, it is desirable to make distinctions among three broad types of program success:

A. Success measured by Objective Academic Outcomes
(e.g., Nursing A.A. Graduation rate)

B. Success measured by Objective Occupational Outcomes
(e.g., Job Placement rate among Graduates)

C. Success measured by Subjective Client Evaluation
(e.g., Student/Employer satisfaction responses)

In this report, only academic outcomes will be considered, formulated in terms of a series of progressive steps leading to the capstone of nursing program academic achievement -- the passing of the National Council Licensure Examination for Registered Nursing or NCLEX-RN. The sequential steps and associated rates of achievement to be discussed are:

1. From non-studying to studying nursing major
2. From studying major to Nursing A.A. graduate
3. From graduate to registered nurse via successful passage of the NCLEX-RN

Step 1: Conversion to Studying Major. Actually embarking upon a course of nursing study represents the first real step along the path leading to becoming a registered nurse. It is the conversion of mere intention into positive action.

TABLE 5. PROGRESSIVE TYPES OF NURSING MAJORS BY DEMOGRAPHIC AND ACADEMIC CATEGORIES - ALL YEARS (1968-1989)

	Unbegun Majors-1	Balked Majors-2	Progressing Majors-3	All Majors
Male	8	10	7	8
White	40	51	73	55
Black	55	43	23	40
Other	5	6	4	5
Under 21	38	44	40	40
21-25	24	21	21	23
26-35	25	25	27	26
36-60	12	9	12	12
Over 60	<.5	-	<.5	<.5
Married	37	36	47	41
Non-Citizen	8	7	4	6
Fulltime/LT	5	7	38	19
Oth College	33	47	49	41
All Crs: B/A	17	20	29	23
All Crs: C	21	37	64	41
All Crs: D	18	22	6	14
All Crs: D-/F	43	22	<.5	23
Devl Crs: 1+	52	39	24	39
[HEADCOUNT]	[2409]	[684]	[2148]	[5241]
(% of TOTL)	(46)	(13)	(41)	(100)

* See Table 3 for Row Category Descriptions
1-Never took a single Nursing course
2-At least 1 Nursing course but no passing grades (> F)
3-At least 1 Nursing course and 1 passing grade (> F)

Table 5 above shows the overall percentage of nursing majors 1968-89 failing to take this step (Unbegun Majors) and those who did and proceeded to cumulative study (Progressing Majors). In addition, the table provides data on those who attempted but failed to get through their entry nursing courses (Balked Majors). The distribution of Unbegun, Balked and Progressing Majors across the usual demography and academic categories is also shown so that the discussion of the correlates of nursing student progress can begin. (Two variables found on Table 4 are dropped due to irrelevancy -- Study Duration and Nursing GPA -- since these are zero by

definition for Unbegun Majors.)

During the last two decades a majority (54 percent) of the declared nursing majors at PGCC took the first step by attempting a nursing entry course. Of these, about a quarter (24 percent) however were not able to acquire any passing grade of D-A and thus were balked from pursuing their nursing studies further. Becoming a Balked Major was the fate of about one in ten (13 percent) of all majors. Thus, once she declared, the odds of a nursing major beginning nursing study were roughly even; those for becoming a progressing student were about 2:3 (progressing Studying Majors -- 41 percent of all majors).

Among the demographic factors, Gender and Age seemed to have almost nothing to do with these odds; Marriage Status appeared only little more active (about 10 percent more of the Progressing Majors were married compared with both Unbegun and Balked groups), while the percentages of foreign students in all three group were so low that it is difficult to gauge any trend. Only the racial background of nursing students revealed a clear, strong association with nursing study progress: percent non-white -- Unbegun Majors 60, Balked Majors 49, Progressing Majors 27.

All four academic variables seem predictive, three to a very significant extent. Full-time students are almost non-existent in the Unbegun and Balked categories but represent almost two-fifths (38 percent) of all Progressing Majors. The proportion of Developmental course-takers declines from over half (52 percent) among Unbeguns to merely a quarter (24 percent) of Progressing students. And, viewed in raw general GPA scores, the means going from Unbegun to Balked to Progressing headings are 1.40-2.02-2.65. Clearly, academic dedication and performance count towards academic progress. (As for the weaker academic variable, having collegiate experience other than that derived from PGCC is somewhat less characteristic of Unbegun Majors than of the others.)

Table 6 (p. 17) is an attempt to track progress group proportions over time. Prior to 1979, only about a third (35 percent) of PGCC's declared nursing majors got stuck in the Unbegun category. Then, during this passing decade the Unbegun percent beginning at '45 slowly rose until it reached a peak among last summer's entrants -- 77 percent. Conversely, the Progressing Major segment has been shrinking -- from 54 percent pre-1979 to only 16 percent most recently.

But caution must be exercised lest these findings be over-interpreted. The curves presented should not be taken at face value because the meaning of "Unbegun" major becomes increasingly more problematic as one moves closer to the present.

TABLE 6. PROGRESSIVE MAJOR TYPES BY ENTRY ACADEMIC YEAR - FALL (PLUS SUMMER)/SPRING*

	Unbegun Majors	Balked Majors	Progressing Majors	No. All Nursing Majors
Pre-1979	35	11	54	(2251)
1979-80	45	12	43	(266)
1980-81	44	17	39	(308)
1981-82	46	15	39	(378)
1982-83	55	14	31	(382)
1983-84	50	13	37	(289)
1984-85	58	9	33	(259)
1985-86	54	15	32	(231)
1986-87	56	15	29	(207)
1987-88	61	15	24	(231)
1988-89	67	17	16	(324)
Fall 89	77	22	1	(115)
1979-82	45	15	40	(952)
1982-87	54	13	32	(1368)
1987-Su89	67	17	16	(670)
ALL YRS	46	13	41	(5241)

* See Table 5 for Column Category Descriptions

One would like "Unbegun" students to refer only to those who withdrew from PGCC before attempting any nursing classes; however, the limited variables we have been forced to use to define "Unbegunness" do not preclude the possibility of presently continuing students falling into this category, students who have not as yet had a full opportunity to advance to nursing course-taking. (As we shall see, it takes 50 percent of our eventual studying majors two years or more after arrival to attempt a nursing course.) This is because the technical definition of "Unbegun" is: no course-taking before the last term of attendance noted by the Registrar, although last term of attendance does not necessarily mean withdrawal term. This poses little or no interpretation difficulty for students whose entry classes were early ones and whose last terms of attendance precede the last possible set of terms covered in this study, e.g., Spring, Summer I and Summer II of 1989. They can safely be assumed to have left the College, at least temporarily. But the overwhelming majority of late year entering students (roughly those arriving 1987-

present) have just these terms recorded as their last, and for a majority of this majority this simply means term "previous" to continuing in Fall 1989.

We conclude that the 1987-Summer '89 figures are not fair indicators of Unbegunness and so also of neither of the other two categories of study progress. The most recent set to provide such fair indication available is that of the very stable years 1982-1987. And during this period 45 percent of all declared majors became studying majors, 13 percent faltered at the entry course level, but about a third (32 percent) went successfully through these and on to further nursing study. Therefore, our study's most realistic estimates of First Step PGCC Nursing Program rates of success are: **Studying Majors 45 and Progressing Majors 32 percent of all Declared Majors.**

Step 2: Conversion to Nursing A.A. Graduate. Winning an Associate of Arts degree in Nursing is the obvious next step in academic progress toward a registered nursing license. Table 7 (p. 19) sets out the overall 1968-87 proportions of Studying Majors in non-graduating and graduating groups as well as their demography and distributions across academic categories.

For all Studying Majors 1968-89, the table reports a 47 percent rate of non-graduation and a 53 percent rate of graduation. We would argue that total number of Studying Majors is the proper denominator on which to base graduation success calculations. Figures based on total number of Declared Majors, however, are easily computed, and are: 72 percent no Nursing A.A., 28 percent earning a Nursing A.A.

The main demographic differences between non-graduates and graduates, according to Table 7, relate to Marriage Status and Race. Half of our Nursing A.A. achievers over the last two decades have been married, while more than three in five leaving without a degree were singles. (Age, which turned out to be an important differentiator among study progress groups is relatively weak here as a discriminator; distinctions show up mostly at the extremes -- about three out of four (74 percent) of the Under 21s failed to graduate while almost 60 percent of the Over 35s earned degrees.)

Nursing graduates proved very unlikely to be non-white (only 22 percent); in contrast non-whites made up 43 percent of the non-graduate group. The racial effect is even more striking when percentages are run in the other direction, from race group to degree group -- 60 percent of white studying majors earned a Nursing A.A. compared with only 36 percent of the non-whites.

TABLE 7. STUDYING MAJOR NON-GRADUATING AND GRADUATING NURSING STUDENTS BY DEMOGRAPHY AND ACADEMIC CATEGORIES - ALL YEARS (1968-1989)

	No A.A.	A.A.	Studying Majors
Male	9	6	8
White	57	78	68
Black	37	19	28
Other	6	3	4
Under 21	16	5	10
21-25	34	37	36
26-35	34	37	36
36-60	16	20	18
Over 60	-	<.5	<.5
Married	38	50	45
Non-Citizen	7	3	5
Fulltime/LT	11	48	30
<1Yr Study	41	<.5	19
1 - <2 Yrs	28	32	30
2 - <3 Yrs	18	46	33
3 - <4 Yrs	5	12	8
4 Yrs Plus	9	11	10
Oth College	46	50	48
All Crs: B/A	28	48	41
All Crs: C	39	51	47
All Crs: D	25	1	9
All Crs: D-/F	8	-	3
Nur Crs: B/A	29	49	40
Nur Crs: C	47	51	49
Nur Crs: D	15	<.5	7
Nur Crs: D-/F	10	-	5
Dev Crs: 1+	35	21	28
[HEADCOUNT]	[1332]	[1483]	[2815]
(% of TOTL)	(47)	(53)	(100)

* See Table 3 for Row Category Descriptions

Gender and Citizenship impact little on graduation rate mostly because so few males and non-citizens show up among Studying Majors. Men constitute only 8 percent, foreigners only 5 percent. This does not mean, however, that if their numbers were considerably greater that their effect on graduation rate would still be small. To the contrary, it would be significant, as demographic-to-graduation group percentaging shows: men were 10 percent less likely to become graduates than women, and non-citizens 19 percent less likely than citizens.

Academics, though, showed even more power than demographics in distinguishing graduates and non-graduates. Almost half of all A.A. achievers were full-time students (48 percent); only 11 percent of the non-achievers were. The proportion of A and B students (measured by both general and nursing GPA) among the graduate group was almost double that included among non-graduates. And Developmental course-takers were almost 70 percent more likely to show up without than with A.A.s (35 to 21 percent, respectively).

Except that it is organized on the basis of study class years rather than entry class years, Table 8 (p. 21) is similar to Table 6 and will help us get a fix on the best and most realistic estimate of PGCC Nursing Graduation rate -- progress Step 2. On the surface, it depicts a trendless and mildly fluctuating set of graduation rates (between 54 and 63 percent) for the whole period of 1968-1986. The pre-1979 average was 63 percent while the 1979-86 showed a mean of 59 percent. Thereafter, the percentage of Nursing A.A.s earned by study classes plummeted from 40 to 0.

As before, we face the question of whether the later apparent trend is real or an artifact of measurement method. The answer is the same: variable definition and data limitations conspire to mislead us. In this case the problem is with the definition of "Non-Graduate," which includes all studying majors with no record of nursing degree achievement by the date of their last known term of attendance. These criteria were supposed to classify as Non-Graduate only students withdrawing from PGCC before acquiring A.A.s in nursing. But once again, "last" term does not always mean "drop-out" term, especially for students coming late to nursing course-taking, most of whom will not have had the chance to accumulate sufficient program credit hours and whose last term is simply the one previous to continuing in Fall 1989. (Over the whole period considered, 50 percent of all studying majors required more than 2 years to complete their programs.)

The implication is that the mean rate for the years 1986-89 must be set aside as unreliable estimator; too many students in this interval are still in process of degree achievement. We consider the mean graduation rate for the fairly recent and very stable 1982-86 period a satisfactory alternative.

TABLE 8. NURSING A.A. ACHIEVEMENT RATES BY STUDY CLASS YEAR - 1968-1989

Nursing A.A. Graduate Percent of Studying Majors

			Pre-1979	63	(1265)
1979-80	61	(119)	1979-82	58	(444)
1980-81	54	(120)			
1981-82	59	(205)			
1982-83	57	(166)	1982-86	59	(614)
1983-84	62	(179)			
1984-85	59	(150)			
1985-86	56	(119)			
1986-87	40	(137)	1986-F89	15	(492)
1987-88	11	(140)			
1988-89	1	(175)			
Sumr 89	-	(40)			
			ALL YRS	53	(2815)

Therefore, **our study's estimate of recent PGCC Nursing Program graduation rate is 59 percent.** (A precisely comparable figure using all Declared Majors as the denominator cannot be calculated because the table's 1982-86 interval is based upon Study Class years; however, the figures for the rough Entry Class 1980-84 parallel would be 54 percent of Studying Majors and 27 percent of all Declared Majors graduating.)

It remains in this section to examine how PGCC's nursing graduation performance compares with that of its peer institution in Maryland. Table 9 (p. 22) contains the basic data for this discussion.

The second column shows the raw number of Nursing A.A.s generated in 1984-1988 by all fourteen Maryland community colleges with comparable nursing programs, as culled from the State Board of Community Colleges Program Data Monitoring System reports. Column Three repeats this data in the form of percentages of nursing A.A.s generated by all institutions over that period. Column Four represents the sum of each college's annual nursing enrollment over the four years in question.

TABLE 9. COMPARISON OF PEER INSTITUTION NURSING A.A. GRADUATION RATES (1984-1988)

	Grad Rate Index*	Nurs AA Grads 84-88	Nurs AA % of All Grads	Sum of Nursing Enrllmts 84-88**	Nurs Sum % of All Enrllmts Sum
Wor-Wic Tech	.75	(182)	4.6	(244)	1.2
Hagerstown	.43	(129)	3.3	(298)	1.5
Charles	.41	(188)	4.8	(462)	2.4
Montgomery	.35	(329)	8.3	(953)	4.9
Allegany	.26	(357)	9.0	(1,382)	7.0
Howard	.24	(325)	8.2	(1,365)	6.9
Harford	.23	(343)	8.7	(1,497)	7.6
Baltimore	.21	(212)	5.4	(1,004)	5.1
Frederick	.20	(135)	3.4	(669)	3.4
Cecil	.18	(113)	2.9	(623)	3.2
Essex	.17	(386)	9.8	(2,327)	11.8
PGCC	.16	(515)	13.0	(3,172)	16.1
Catonsville	.15	(503)	12.7	(3,275)	16.7
Anne Arundel	.14	(337)	8.5	(2,373)	12.1
ALL SCHOOLS	.20	(3,951)	100.0	(19,649)	100.0

Sources: State Board of Community Colleges, Program Data Monitoring System, Reports 1984-88

* Index = (1984-88 Total No. of Nursing A.A.s/ 1984-88 Nursing Enrollment Sum).

** Nursing Enrollment Sum is the result of the simple addition of all individual annual nursing enrollments. Therefore "sum" does not equal "total" cross-year enrollment due to case duplication.

The last column repeats this data in the form of percentages of the state sum of all-majors annual enrollment over the same four years. The first column provides institution "Graduation Rate Index" scores, by which the colleges are rank-ordered, giving the table its row organization. The index is computed by dividing the total number of nursing A.A.s for each college by its nursing enrollment sum, and is meant in the absence of more exact data to give at least a crude indication of relative nursing major graduation rates. (The roughness results from the statistical "impurity" of the nursing major denominator which contains duplicated cases.)

PGCC's nursing program is shown to produce larger numbers of nursing A.A.s than any other community college in the state -- 515 over the 1984-88 interval -- which represents 13 percent of all state graduates, not surprising since its nursing program is also the biggest among Maryland peer institutions. However, this percentage is somewhat below the estimated 1984-88 PGCC nursing major proportion of all state CC nursing majors (16 percent), a lag suggesting some relative weakness in nursing A.A. generation. This is further born out by PGCC's graduation index score of .16, which is significantly below the state average (.20) and which places it only at the twelfth rank out of fourteen.

On the other hand, a more thorough examination of Table 9 reveals a perhaps mitigating pattern: there exists a strong negative correlation (-.64) between graduation rate index score and absolute size of nursing program (sum of nursing enrollments). Top ranking schools in nursing graduation rate tend to have very small nursing programs (e.g., Wor-Wic Tech with an index score of .75 but accounting for only 1.2 percent of all state majors).

This may be a function of the extra-special attention which can be paid to each individual student and each aspect of the nursing program, while the large schools must struggle to find the time and resources to personalize and enhance their programs. Or perhaps the known higher full-time/part-time ratios enjoyed by small schools and leading to faster student advancemnent may play a role.)

In any case, we may observe that if the peer institution list is restricted to those four institutions with nursing enrollments according to Table 9 of 2,000 or better (in some sense PGCC's true peer group), then our college's nursing program does relatively well, coming in second behind Essex but ahead of both Catonsville and Anne Arundel.

State reported data also permits a glance at 1984-88 rates of change in the number of nursing graduates among peer institutions. Table 10 (p. 24) ranks all fourteen peer community colleges in terms of four-year average annual percentage increase or decrease in the number of nursing students earning A.A. degrees. What it shows is that nursing graduate numbers have been annually falling off of late almost everywhere. Only four peer institutions managed overall gains (Wor-Wic Tech leading with an increase of 13.8 percent) while the rest dropped, some precipitously, like PGCC rivals Catonsville (-10.4 percent) and Essex (-20.2 percent). PGCC's performance fell into the middle range (-6.9 percent), actually beating the whole peer group of community colleges (-8.6 percent).

TABLE 10. NURSING PROGRAM A.A. GRADUATE NUMBERS 1984-89 COMPARED WITH PEER COLLEGE TRENDS

	Mean Yrly % Change		Mean Yrly % Change
Wor-Wic Tech	13.8	Anne Arundel	- 6.3
Baltimore	6.1	**PGCC**	**- 6.9**
Hagerstown	5.2	Howard	- 9.2
Charles	4.0	Montgomery	- 9.3
Cecil	- 2.1	Frederick	- 9.4
Allegany	- 2.3	Catonsville	- 10.4
Harford	- 6.1	Essex	- 20.2
ALL PEER CCs*			- 8.6

Sources: State Board of Community Colleges, Program Data Monitoring System, Reports 1984-88; PGCC Internal Reports
* Including Prince George's Community College

Step 3: Conversion to Licensed Registered Nurse. The last academic step is the passing of the National Council Licensure Examination for Registered Nursing, which is scheduled twice annually (February and July) and ideally is taken at the first opportunity by nursing graduates. Successful completion of the NCLEX-RN means automatic licensing. It is expected that license candidates pass the exam on their first attempt; however, with permission multiple attempts are possible.

Like the SAT and GRE tests, the NCLEX is a standardized national examination purported to be as culturally and regionally unbiased, and as little varying in knowledge and skill areas covered year to year, as possible. (Both assertions have become somewhat controversial lately. Some, including black caucuses within the nursing profession, question NCLEX's racial unbiasedness; others note that important substantive revisions have sporadically occurred, particularly in 1989 with a significant enlargement in the coverage of hands-on field experience which requires just the sort of training difficult for many community college programs to provide for their students.)

All correct question responses are accorded numerical values, the sum needed for passing being a hard fixed 1600. Through 1988, NCLEX policy was to post raw total scores as well as simple pass/fail indication to examinees and relevant parties like community college nursing departments. On the grounds, however, that dissemination of raw scores might possibly lead to breaches of confidentiality and the unfair jeopardizing of nursing careers, this policy was cancelled with the 1989 exams; now, only simple

pass/fail indication is made known to those concerned.

From a research perspective, this last move was unfortunate because it severely limits the kinds of statistical techniques which can be brought to bear upon analysis of NCLEX performance. But there are other hindrances to our analysis which we must mention as well before turning to a substantive discussion of PGCC graduate licensing rates. Here, we find ourselves unable to make the kind of confident generalizations concerning overall success rates we gave out concerning conversions to studying major and nursing graduate. For these, we could base our conclusions upon large, complete data sets including all PGCC declared majors and their academic histories over the whole of two decades. But NCLEX results are not part of PGCC's regular system of student tracking. These must be independently collected and then specially match merged with our computer files. Available to us for this study was only a small sample (n=237) of the most recent PGCC NCLEX-takers. Although the sample was virtually complete for last six NCLEX opportunities (February 1987-July 1989) and quite matchable back to our general student files, still the small sample size made detailed category analysis very awkward and the limited time range produced only one complete entry class whose career could be accurately traced from Declared Major to Nursing License.

But putting caveats aside, what <u>can</u> be said about PGCC nursing license rates with the data on hand?

Table 12 (p. 26), like Tables 5 and 7 before it, displays the whole-base division among progress groups and group distributions across demographic and academic categories. In this case, of course, the progress groups are NCLEX passers and failers, but we need to add only of a particular sort. "Passing" and "failing" here refers only to first-time test-taking results. This is done for two reasons. First, such is the form used in the reports of both the State Board of Community Colleges and the Maryland Board of Nursing. Second, first-time performance is the most likely gauge of the main concern of this section -- how well does the PGCC nursing program prepare its nursing graduates for their licensing exams. Second- and Nth-time performance may be conditioned partly by factors other than college program (e.g., growing familiarity with the exam, extra personal study, etc.).

Actually, there is also a third reason. Typically, Maryland community college nursing graduates, even on their first tries, pass the NCLEX overwhelming. PGCC's graduates are no exception in this regard; our 1987-89 sample's pass rate is 79 percent, as Table 11 indicates. Naturally, the cumulative pass rate goes up over a number of attempts (the last-time pass rate for our sample was 88 percent), but 79 percent is already awkwardly lopsided from the analyst's standpoint. At this level of category skew, it already becomes difficult to judge differences across several variables.

TABLE 12. PGCC NURSING GRADUATE PERFORMANCE ON NCLEX-RN: FIRST-TIME PASS AND FAIL GROUPS BY DEMOGRAPHIC AND ACADEMIC CATEGORIES (1987-1989)

	Fail	Pass	Entire Sample
Male	2	5	5
White	31	66	59
Black	65	30	38
Other	4	3	3
Under 21	2	2	2
21-25	45	36	38
26-35	27	39	37
36-60	27	23	24
Over 60	-	-	-
Married	33	46	43
Non-Citizen	10	4	5
Fulltime/LT	16	32	29
<1Yr Study	-	1	<.5
1 - <2 Yrs	12	23	21
2 - <3 Yrs	47	42	43
3 - <4 Yrs	22	18	19
4 Yrs Plus	18	16	16
Oth College	41	48	46
All Crs: B/A	6	49	41
All Crs: C	94	51	59
All Crs: D	-	-	-
All Crs: D-/F	-	-	-
Dev Crs: 1+	53	23	29
[HEADCOUNT]	[49]	[188]	[237]
(% of TOTL)	(21)	(79)	(100)

This preliminary finding leads to a more important point. The sample's 79 percent first-time pass rate, although not definitive of PGCC's true recent rate as we shall see, is broadly indicative of that true rate. And although 8 out of 10 first-time NCLEX successes might seem quite respectable to the outsider, it is <u>not</u> considered so by Nursing Board reviewers who are unsatisfied with any rate under 85 percent. Moreover, data we will shortly present show that the PGCC first-time NCLEX pass rate has been dropping

seriously in recent years and that it is almost always found to be lower than those of most peer institutions. All this is cause for real concern, and makes an understanding of the forces at work in determining PGCC NCLEX performance crucial.

It would appear from Table 12 that Race is the only really important demographic correlate with NCLEX performance. Fully two-thirds of the Passers in our sample proved to be white while more than two out of three test-takers scoring below 1600 turned out to be non-white. The white percentage difference between pass and fail groups was 35 percent. The next most powerful demographic predictor -- Marriage Status -- paled in comparison; the difference in married percentages between pass (the higher) and fail groups was only 13 points. Age showed little impact, manifesting only a slight older student bias among Passers.

But even exceeding the ethnic factor in cogency were the two academic variables General GPA and Developmental Course-taking. (Table 11 drops Nursing GPA from consideration as redundant; within our NCLEX sample General and Nursing GPA distributions parallel each other almost exactly.)

TABLE 13. PGCC NURSING GRADUATE FIRST-TIME NCLEX PASS RATES COMPARED WITH PEER COLLEGE TRENDS (1984-1988)

Mean 1st-Time Passing % :	80-88	80-82	83-85	86-88
Frederick	>99	100	99	100
Montgomery	96	100	95	92
Baltimore	96	98	94	94
Wor-Wic Tech	95	96	96	93
Anne Arundel	93	87	94	97
Hagerstown	93	93	92	94
Catonsville	93	92	94	92
Essex	92	92	92	93
Allegany	90	93	90	89
Harford	90	83	91	92
Cecil	87	--	83	91
Howard	87	85	87	88
PGCC	**84**	**80**	**87**	**84**
Charles	84	77	86	86
ALL PEER CCs*	91	90	92	92

Sources: Maryland Board of Nursing, **Annual Report 1988**
* Including Prince George's Community College

The Fail group was almost empty of GPA equivalent B-or-better students (6 percent) while these made up almost a majority of passing examinees (difference 45 percent). Developmental course-takers were predominant in the Fail group (53 percent) but for a 30 percent difference constituted fewer than a quarter of the Pass category (23 percent).

According to statistics supplied by the Maryland Board of Nursing on state community college annual NCLEX performance (fiscal years/successive July-February NCLEX pairs), 84 percent of PGCC examinees managed to pass on their first attempts over the period 1980-1988. This near decade average comes very close to the par of 85 percent, but masks a good deal of fluctuation. In particular the last Board-supplied figure (FY 1987-88) was 78 percent passing, down from the previous year's 88 percent. Using our sample data we are able to supply estimates of post-FY87 performance to extend the trend through July 89's examination:

FY 1986-87	88 %
FY 1987-88	78 %
FY 1988-89	68 %
July 1989	78 %

Thus, the extended curve depicts at very least the existence of a current sub-80 percent slump, one not necessarily bottoming at 68 percent in 1988 for it is to early to tell if last July's 78 percent rebound represents the beginning of a trend.

Furthermore, Table 13 nails down PGCC's NCLEX performance deficit relative to other state communities colleges. PGCC ranks thirteenth out of fourteen for the whole 1980-88 period, the same 1980-82, twelfth 1983-85 and last 1986-88.

Nursing Program Outcomes: A Cohort Analysis. In the preceding three sections this study attempted to arrive at fair outcome rate estimates one outcome one class at a time. Now, finally, with the nature of the data and essential variables well discussed, we are in position to approach the question of outcome rates more systematically -- through cohort analysis.

Cohort analysis sets out to establish what trends characterize a group of people all who began undergoing a particular process at the same time. Such a group is called a "cohort." For our purposes, cohorts were nursing major entry year classes -- sets of majors who began attending PGCC during the same term, aggregated by Academic Year (Fall + Sum I and II/Spring). These form the basis for the organization of Table 14 below (p. 29).

The table is designed to capture the declared major rates of conversion first to studying major status and then to Nursing A.A. graduate status.

TABLE 14. COHORT ANALYSIS: CUMULATIVE RATES OF CONVERSION TO STUDYING MAJOR AND NURSING GRADUATE AFTER 2, 4, 6, 8 AND MAXIMUM YEARS OF ATTENDANCE BY YEAR ENTRY CLASSES

A. Studying Major Conversion

Entry Class Years	(Max Yrs Possible Attend.)	Begin Study by End 2	4	6	8	Max	As of Sprg 89 Study Unbegun Cont	Out	[Nos.]
1979-80	(11**)	14	35	44	50	55	<.5	45	[266]
1980-81	(10)	17	38	47	52	52	1	47	[308]
1981-82	(9)	16	39	49	53	53	<.5	47	[378]
1982-83	(8)	10	30	39	45	45	4	51	[382]
1983-84	(7)	12	35	49	50	50	2	48	[289]
1984-85	(6)	9	29	42	*	42	5	53	[259]
1985-86	(5)	15	40	46	*	46	6	48	[231]
1986-87	(4)	16	44	*	*	44	10	46	[207]
1987-88	(3)	27	39	*	*	39	21	40	[231]
1988-89	(2)	33	*	*	*	33	49	18	[324]
1979-85	(6-10)	13	34	45	49	50	2	48	[1882]
1985-87	(2-5)	24	38	40	40	40	24	36	[993]

B. Nursing A.A. Conversion

Entry Class Years	(Max Yrs Possible Attend.)	Graduation by End 2	4	6	8	Max	As of Sp89 No A.A. Cont	Out	[Nos.]
1979-80	(11**)	6	20	28	31	33	3	19	[266]
1980-81	(10)	5	21	26	30	31	3	18	[308]
1981-82	(9)	7	22	30	32	32	2	18	[378]
1982-83	(8)	1	15	22	24	24	3	18	[382]
1983-84	(7)	2	17	24	24	24	6	20	[289]
1984-85	(6)	3	15	21	*	21	5	16	[259]
1985-86	(5)	6	18	18	*	18	14	14	[231]
1986-87	(4)	6	14	*	*	14	19	11	[207]
1987-88	(3)	2	2	*	*	2	31	6	[231]
1988-89	(2)	0	*	*	*	0	30	3	[324]
1979-85	(6-10)	4	18	25	27	28	4	18	[1882]
1985-87	(2-5)	3	8	8	8	8	24	8	[993]

Each conversion rate appears as a cumulative series of percentages giving the proportion of all declared majors in an entry class which had made the status transition by the time indicated -- end of year 2, 4, 6, 8 and the last possible year of attendance considering the entry year date. (For example, by the end of the Class 79's eighth year, 50 percent in this cohort had become studying majors.) The columns headed "Cont(inuing)" show the percentage of students in each class who are still "in the pipeline" -- "unconverted" but still enrolled as of Spring/Summer 1989. The "Out" columns display the proportions of "unconverted" entry class students whose last term of attendance preceded Fall 1989, in other words those who stopped attending from PGCC without a status change.

Single asterisks (*) on the table indicate time inapplicability, the fact that the indicated time slot exceeds the maximum possible for a particular entry class (e.g., to date, it has been only seven years since the start of Entry Class 1983-84; thus no figure is shown for the year 8 observation point). The double asterisk next to the Maximum Year column is just a reminder that the last possible "year" for any group is only a part-year, Summer I/II 1989.

Since every percentage on Table 14 has the same calculation base -- total Entry Class Declared Majors -- one can follow them sequentially over time to trace the pattern of each cohort's academic progress towards studying major status and on to nursing graduation, as far as the data permits. For classes 1979-80 to 1984-85, this is virtually the entire class career judging by the very marginal percentages of continuing students left over from these groups. Almost all of their original inhabitants by this time either have left PGCC with nursing degrees in hand or have fallen by the wayside as permanent non-studying nursing majors or nursing non-graduates. Thus, hard conversion rate estimates can be derived for this period. For the more recent post-1984 students, the large proportions of students "still in the pipeline" preclude making final estimates of conversion rates; however, many of the percentages in the in-transit columns may still be usefully compared with parallels for the earlier classes. Finally, it should be pointed out that in both early and late cases the "ultimate" status percentages of each class sum to 100, meaning that all of its students are accounted for under some heading or other. (The ultimate statuses are: Unbegun/Withdrawn + Unbegun/Continuing + Studying/Withdrawn + Studying/Continuing + Nursing A.A. Graduate.)

The substantive findings of Table 14 are as follows: First, for the most recent group of Entry Classes permitting stable, complete conversion estimates (1979-85), we discover that **overall, 50 percent of Declared Nursing Majors make the transition to Studying Major successfully, and 28 percent go on to win Nursing A.A.s** (or 56 percent of all Studying Majors). Second, Studying

Major and Nursing A.A. conversion rates compared across the classes in this period show considerable similarity; however, upon closer examination there appears a detectable downward trend in both cases. For 1979-82, the average Studying Major conversion rate was about 53 percent, dropping to around 46 percent for the 1982-85 interval; likewise, graduation conversion went from 32 percent on average to approximately 23 percent. Unfortunately, the data for the most recent years is too incomplete to allow any judgements to be made concerning trend continuation. Third, the data suggest in crude fashion that over half of all conversions occur before the finish of the fourth year. Table 15 below elaborates on the timing dimension of academic progress, most importantly documenting that during this last decade it took the average Nursing Declared Major about 1.7 term-years after enrolling to begin taking Nursing courses and another 2.2 to earn her nursing degree -- 3.8 term-years altogether.

TABLE 15. TIMING OF CONVERSIONS TO STUDYING MAJOR AND NURSING A.A. GRADUATE

Percent by Yr Intervals	Declared Major to Studying Major	Studying Major to Nursing A.A.	Declared Major to Nursing A.A.
Under 1 Year	43 %	<.5 %	<.5 %
1 - 1 Yr 3 Terms	32 %	32 %	9 %
2 - 2 Yrs 3 Terms	10 %	46 %	35 %
3 - 3 Yrs 3 Terms	5 %	12 %	22 %
4 - 4 Yrs 3 terms (Plus)	11 %	11 %	12 %
5 - 5 Yrs 3 Terms	*	*	8 %
6 Yrs Plus	*	*	15 %
Quartiles by Term-Yr**			
25 % within	.50	1.50	2.25
50 % within (Median)	1.00	2.00	3.25
75 % within	2.00	2.50	4.50
Mean Term-Yr	1.68	2.46	3.84
Group Base***	(2488)	(1309)	(1309)

* Inapplicable; falls under 4 Yrs Plus category

** Term-Yr is calculated on a College Term basis; each term (Summer-I/Summer-II/Fall/Spring) is set to .25 of one Academic Year.

*** N=2488 (Studying Majors only); missing cases=328; N=1309 (Nursing Graduates only); missing cases=23; Missing cases due to incomplete initial study term data.

The real difficulty in estimating Nursing academic progress occurs when we attempt to generate rates for conversion to Licensed Nurse. This is because, unlike the Studying Major and Nursing A.A. instances, the study did not have available data for all Nursing Declared Majors for all years. The Registrar's Office does not collect such data, and the Nursing Division after much effort was only able to provide information in 237 cases. Fortunately, these represented a usable block -- all PGCC nursing graduates who sat for the NCLEX-RN for all of the last six scheduled examinations (February 1987-July 1989), except for two students -- but even so, the students taking these tests were spread over many years of entry classes and did not represent all students from these classes.

A special procedure had to be developed in order to utilize this material to derive any sort of conversion estimate comparable, even roughly, to those embodied in Table 14. The procedure involved a kind of backwards-working trial-and-error strategy: First, we distributed our NCLEX sample across all entry classes, looking to identify and eliminate from further consideration all entry classes with only smatterings of test-takers. Once done, this left us with only those NCLEX sample members within entry classes which proved to be relatively crowded with them. Hypothesizing that NCLEX-concentrated entry classes stood the greatest chance of being beginner groups possessing adequate amounts of data for academic career tracing in all three conversion categories, we then checked them against two criteria logically indicative of data completeness -- 1. Was the number of test-takers the same or close to the number of Nursing A.A. Graduates in the targeted classes (Graduates almost always go on to the NCLEX)?; 2. Was the proportion of "pipeline" cases (Studying Majors still attending PGCC) zero or marginal? The Entry Classes passing all of these procedures and checks were 1984-85, 1985-86 and 1986-87.

The next-to-last step was a practical one. The NCLEX sample group being small to begin with, it turned out that insufficient numbers of members existed in individual Entry Classes to permit the sort of class-by-class academic progress tracing found in Table 14. Thus, all three classes had to be joined in a single 1984-87 Combined Entry Class Cohort. Finally, this accomplished, conversion rate estimates, this time also for transition to Licensed Registered Nurse, were generated by the usual method. The results are displayed in Table 16 (p. 33):

Given Table 14, the pattern of the figures in the Studying Major and Nursing A.A. conversion columns is about one would expect. In time, the Combined Cohort falls roughly between 1979-85 and 1985-89 intervals and shows correspondingly in-between conversion rates -- to Studying Major 44 percent, to Nursing A.A. 18 percent, with the jury still out on about 21 percent of the original 697 Declared Majors.

TABLE 16. COHORT ANALYSIS: CUMULATIVE RATES OF CONVERSION TO STUDYING MAJOR, NURSING GRADUATE AND NCLEX-RN PASSER FOR COMBINED ENTRY CLASS COHORT 1984-1987
(N = 697)

By End of Year:	To Studying Major	To Nursing A.A.	Passing NCLEX
1	5	0	0
2	13	5	3
3	27	14	9
4	37	16	11
5	43	18	12
6	44	18	13
Cont/No Convers	7	13	*
Out/No Conversn	49	13	*

The more interesting column, of course, is the Passing NCLEX one which reveals that by the end of the cohort's sixth year 13 percent of its founding sisters (or 76 percent of cohort members then graduated) had finally won their way through to a Registered Nursing license. The problem is that these proportions are not the last word. A fifth of the cohort still awaits ultimate disposition and many NCLEX re-takes will be tried by presently exam-failing graduates, so we can be sure that several percentage points will be added to both graduation and test-passing columns before the cohort is completely exhausted. But how many?

To get an answer at least in the form of an estimate, an additional cohort analysis was conducted. Our research managed to turn up one nursing cohort that had run its full course (no remaining undisposed of students), formed by joining semester study classes Spring 1985 and Fall 1985. Although this combined cohort was study class- rather than entry class-based and thus could not be directly compared with Table 16's classes, what it could provide was a firm final rate for graduate-to-NCLEX passer which then could be applied in projecting ultimate Table 16 results. With this caveat: the study class cohort data is in effect data for early entering students; therefore, its final rate may not perfectly represent final rate by the time of the eventual exhaustion of Table 16's later cohort. (See Appendix for a complete table detailing the academic progress of the Spring/Fall 1985 study class cohort.)

The study class's final graduate-to-license rate was 46 percent of all original studying majors (or 90 percent of all cohort graduates). In our rough and ready projection we shaved this .90 rate down to .75 to err on the side of conservatism, then

multiplied it by an estimate of eventual numbers of new graduates now in the two unconverted/continuing categories. To arrive at the new graduate numbers estimate we simply assigned a third of the continuing non-studying majors to the continuing non-graduate studying major group, and then assigned a third of this merger to the graduate category. (The .33 rates used here are very conservative given the actual effective rates during the first ten years of the cohort's existence.) All of this when cranked through amounts to an additional 4 points in the license column, for an estimated eventual 17 percent total. Thus it is probably safe to guess that **between one in six to one in five PGCC declared nursing majors has fought her way through to become a registered nurse in recent years.**

Models of Nursing Academic Progress

Our final task is to become more systematic concerning why some students progress towards licensed nursing while others stall at points along the way. To enable us to carry out this last assignment, the study included a number of multivariate analyses designed to discover which demographic and academic variables from among the large set we began with were truly causal, which were only spuriously related or unrelated, and how the important factors thus identified worked together to determine student successes and failures.

The specific multivariate method employed is called analysis of variance (or ANOVA for short), which has the power to determine precisely how much independent effect any hypothesized causal variable has on an outcome variable when the interfering and competing impacts of all the other causal variables are also taken into account. It can be thought of as a kind of statistical net which captures only the crucial factors in a sea of causes and lets the little non-significant ones escape. ANOVA also has the capacity to weigh the total impact of the set of crucial factors thus identified (usually called the analytic model) upon the outcome variable, so that the analyst can gauge his overall success in accounting for a phenomenon with the best variables in hand. Without going into the underlying mathematical details, let it simply be noted that the degree of impact determined for both individual causal variables and causal models is traditionally expressed in terms of percentage of variance explained, and that a 100 percent finding for a variable or a model would imply that one could completely predict the correct outcome assignments of cases by means of that variable or model.

But for the institutional researcher, ANOVA has one major drawback. It is mathematically structured only to work with certain types of variables -- integer scales (e.g., age in number of years) or real number scales (e.g., height in inches and fractions of inches). Educational research, however, often

requires the employment of simple category variables like race and full-time/part-time study; and in this study, all three outcome variables are of this type (e.g., NCLEX-Pass/Fail). Fortunately there is a statistical loophole. The simplest form of integer scale is the binary number system -- 0,1. Thus, naturally dichotomous (two-category) variables (of which this study contains many) whose levels are assigned 0 or 1 values qualify as integer scales and can be treated under ANOVA. And even more complicated variables (e.g., Race:White/Black/Asian/Hispanic/Native American) can legitimately be "collapsed down" to two categories for ANOVA inclusion (e.g., White/Non-White). There is a cost associated with this approach, however. Forced dichotomization means some loss of precision in estimating percentage of variance explained, as we shall see, and some other statistical risks we need not discuss here are run. But if one exercises due care in interpreting and cross-checking results, the loses and hazards pale in comparison to the gains in clarity and explanatory power acquired through the employment of ANOVA.

Raw Outcome Correlations. Table 17 below has two purposes. First, it serves to specify the ANOVA-ready dichotomous forms of the study's original full demographic and academic variables. But more importantly, it presents in one location all possible two-way causal variable-to-outcome variable correlations given our data. The correlations are expressed in terms of outcome percentage differences between paired categories.

TABLE 17. NURSING PROGRAM OUTCOMES BY ALL AVAILABLE DEMOGRAPHIC AND ACADEMIC VARIABLES (DICH. FORMS)

	Studying Major Delta	Nursing A.A. Delta	NCLX Pass 1st Time Delta
MALE/Female	- 3	- 11	+ 12
WHITE/Non-White	+ 27	+ 24	+ 24
26 YRS OLD+/< 26 Yrs	+ 11	+ 8	+ 6
MARRIED/Single	+ 7	+ 12	+ 9
FOREIGN/US Citizen	- 14	- 19	- 22
FULL-TIME/Part-Time	+ 42	+ 43	+ 13
STUDY 2.5 YRS+/< 2.5	*	+ 29	- 12
OTH COLL EXPR/PGCC Only	+ 16	+ 4	+ 5
GEN GPA 2.75+/< 2.75	+ 8	+ 17	+ 30
NUR GPA 2.75+/< 2.75	*	+ 15	+ 26
DEVL CRS 1+/None	- 25	- 18	- 31**
A&S CRS 2+/< 2	- 35	- 1	- 6
OUTCOME BASE	[5241]	[2815]	[237]

* Not applicable ** Devl. Math course substituted

For example, the table indicates that the percentage of Studying Majors among men is 3 percentage points smaller than that among women. (The raw figures were 51 to 54 percent, respectively. See the Appendix for tables detailing the size of category populations, exact outcome percentage breakdowns and other relevant information.)

The first category presented (in capital letters) is the "anchor" category; the percentage difference (technically called "delta") is always the remainder left when the percentage of the second or "complement" category is subtracted from the anchor percentage. The +/- sign indicates "direction" of relationship: plus shows a positive one between anchor quality and outcome, minus a negative one. Under ANOVA, the anchor is set to 1 (presence of a quality) and the complement set to zero (absence of anchor quality). Beyond Table 17 just below, each variable will be identified in terms of its anchor quality only.

Consistently high correlating variables prove to be Race/White (delta = > +23 with all three outcomes), Developmental Course-taking (over +17 with all three outcomes) and Non-Citizenship (over +13 with all three outcomes), while Full-Timeness (over +41 with both Studying Major and Nursing A.A.) and High General G.P.A. (+17 with Nursing A.A. and +30 with NCLEX Passing) score highly in two out of three outcome cases. Two other variables also show two out of three moderate-to-high outcome deltas but with reverse effects: Maleness correlates moderately negatively with Nursing A.A. but positively with NCLEX Passing, while Long Study Duration is a strong predictor of Nursing A.A. acquisition (+29) but seems a medium deficit to first-time NCLEX Passing (-12). The remaining variables feature significantly in determining only one outcome case or show little real impact anywhere (Higher Age, Married Status, Non-PGCC College Experience and Humanities/Social Science Course-taking).

But a more useful way of reviewing Table 17's findings is outcome column-by-column. Looking only at the top six correlating variables in each outcome case we get the following rankings:

	Study Major		**Nursing AA**		**NCLEX Pass**	
1.	Full-Time	+42	Full-Time	+43	Devl Math	-31
2.	A&S Courses	+35	Long Study	+29	Gen GPA	+30
3.	Whites	+27	Whites	+24	Whites	+24
4.	Devl Crses	-25	Foreign	-19	Foreign	-22
5.	Oth College	+16	Devl Crses	-18	Full-Time	+13
6.	Foreign	-14	Gen GPA	+17	Long Study	-12
					Males	+12

Because these findings are provisional (the promised statistical controls via ANOVA have yet to be applied), it must be understood that their discussion below will be equally provisional.

The two cross-the-board variables of high impact are Race and Foreign Origin, which also seem to be the only demographic variables of any consistent significance. At every nursing academic crossroad, being white or a U.S. citizen appears to confer advantage, being non-white or an overseas student disadvantage. (Foreign student disadvantages in acquiring Nursing A.A.s and passing the NCLEX have been noted as a general phenomenon in this state [Maryland Board, 1988] and traced mainly to language difficulties and prior nursing training in countries diverging from U.S. nursing practice norms.)

As one would expect, the taking of developmental courses is a strong negative correlator with beginning nursing study; many less academically prepared nursing hopefuls become discouraged or outright fail at this point. But the special flavor of the Study Major column is given by the A&S Course-taking and Alternate College Experience variables, found important only here. That alternate college experience (which includes prior non-PGCC experience) appears significantly related to taking the plunge into nursing course suggests the hypothesis that more broadly prepared or veteran student may have acquired better, more definite career direction than her more novice counterpart. The case of the very strong negative correlation between beginning nursing study and above average course-taking in the humanities and social studies is more difficult to speculate upon. The variable was originally included in the hope that it might serve to indicate a waning interest in nursing brought on by a waxing interest in other subjects. Unfortunately the timing of A&S Course-taking (whether it occurred before or after the inner decision not to follow through on initial nursing interest) cannot be pinned down. If before, then the finding does suggest the subversive effects of exposure to other disciplines; if after, it merely shows that there is academic life after nursing.

But although the interpretation of A&S Course-taking impact on Studying Major conversion is ambiguous, the total lack of significant impact on Nursing AA Graduation and NCLEX Passing unambiguously allows for the cancelation of some other interesting hypotheses. One might theorize that many non-nursing courses would spread nursing student energies too thinly, thus interfering with progress toward the degree and beyond. Or, the reverse might have proved true -- that A&S courses energize and intellectually enhance students no matter which discipline they are pursuing. According to our data, neither theory is demonstrable.

The most interesting thing to us about the Nursing A.A. Conversion column is how it is dominated by the two academic variables which have to do with shear <u>effort</u> -- Full-Time Study

(delta = +43) and Long Haul Study (+29). Apparently, students who dedicate their waking hours to nursing study or who just hang in no matter what the exigencies or who do both dramatically increase their chances of winning a Nursing A.A. in the end. This may not sound like news, but what may be news is how less important academic performance is in comparison. (Although in absolute terms, not at all unimportant: delta = +17.) The grading system has acted as a weaker academic filter than one might legitimately have expected it to act.

One thing that it would be good to reiterate at this point is that the only academic performance variable that counts analytically in this study is General, not Nursing GPA. As we have already discussed, the correlation between the two proves so high that it is virtually impossible to separate out their individual effects upon student progress. And since General GPA's correlations with outcome always turns out to be somewhat stronger than parallel Nursing G.P.A. correlations, we have dropped the latter as both redundant and less indicative of performance effects.

Compared with the data configuration of the Nursing A.A. Conversion column, that of the NCLEX First-Time Pass column is practically the reverse. Here academic performance variables dominate -- Developmental Math Course-taking (delta = -31) and General G.P.A. (+30) -- while effort measures distinctly take second place -- Full-Time Study (+13) and Long Term Study (-12). Perhaps there is little surprise at this, since the NCLEX after all is both an exercise in and a measure of academic performance. Truly, the most intriguing finding in this column has to do with effort, the seeming negative impact of study duration upon NCLEX passing. As an hypothesis, we suggest that study duration with respect to the NCLEX may actually function as a sort of academic performance variable. For students of lesser fact-retention ability, a long spreading out of study may mean loss of much early-gained knowledge, leading to lower NCLEX scores.

It remains to explain why the study substitutes Developmental Math Course-taking for any Developmental Course-taking in the analysis of the NCLEX outcome. The reason has to do with the desire always to utilize the most potent possible measure of a particular concept when there are several conceptually equivalent measures available. This was the basis of our decision to employ General GPA rather than Nursing GPA or both together to gauge course performance. As it turned out, general Developmental Course-taking showed higher impact upon Studying Major and Nursing A.A. outcome than did any particular variety of Developmental Course-taking considered separately. But not in the NCLEX Passing case; here indicated need for remedial training in mathematics clearly surpassed generally indicated remediation need (deltas -31 and -26, respectively). That indicated poor math preparation specifically should reveal the most power when it comes to NCLEX

performance may in itself be significant. Perhaps the mathematical dimension of the NCLEX examination poses a special problem to our nursing graduates, at least to those whose math skills have always been questionable.

ANOVA Outcome Results. The above discussion of raw outcome correlations had to be provisional because measurement of the strength of simple one-on-one relationships cannot be trusted to produce reliable estimates of pure variable weights when the environment conditioning an outcome is a complex field of relationships. In this circumstance, causal variables have a way of impinging upon one another in the production of the overall effect, and it often turns out upon an analysis which truly isolates individual effects that seemingly powerful variables are actually weaker contributors to a phenomenon while seemingly minor variables prove to have major impacts once the statistical noise produced by other factors is filtered out. But this point, perhaps, is best made by illustration, as below:

		White	Non-				FT	PT	
ALL:	% A.A.	60	37	D=+23	ALL:	% A.A.	83	40	D=+43
		White	Non-				FT	PT	
FT:	% A.A.	85	75	D=+10	WHT:	% A.A.	86	47	D=+39
PT:	% A.A.	47	28	D=+18	NWH:	% A.A.	75	28	D=+47
Avr:				D=+15	Avr:				D=+43

We have already noted that the raw Nursing A.A. correlations of Race/White (delta = +23) and Full-Time Study (+43) are among the strongest. But what happens when we introduce statistical controls, for example correlating Race with Nursing Graduation while controlling for the effect of Study Time and vice versa?

Controlling for the effect of Study Time reduces the delta-correlation of Race/White upon Nursing Graduation from +23 to only +15 (or by 35 percent of initial delta) whereas controlling the Study Time-Graduation relationship for Race/White has no impact on the strength of Study Time's power. Once it is known that the white nursing student group contains almost four out of five of all full-time nursing students, what is going on here becomes easy to figure out. The Full-Time/Non-white graduation is almost as good as the white graduation rate, but very few non-whites are full-time students. Over a third of the Race/White-Graduation connection is spurious and is really the Full-Time-Graduation connection in disguise. That is why statistical controls are so important.

The ANOVA method, in effect, is a way of working out the simultaneous impacts of each variable upon all other variables so that in the end each variable's pure singular causal weight is

discerned. Put another way, it is a technique for controlling everything by everything all at once. Furthermore, the entire correlation matrix is weighed by ANOVA for total impact.

We subjected each all-variables outcome correlation matrix to an exhaustive series of ANOVA tests with the goal of identifying the three best models of PGCC Nursing Program outcome. Each model had to meet this objective -- that it be build up out of smallest set of causal variables capable collectively of explaining at least 95 percent of the outcome variance accounted for by all the variables. In other words, our goal was the construction of the most powerful yet most parsimonious model possible to explain each outcome.

The results are summarized in Table 18 (p. 39). The Table reports the final analysis of variance results for the three outcome models surviving the test series, plus ANOVA statistics for two variant models. For each model, percents of outcome variance explained are shown only for those causal variables actually included in the model, plus the total variance by the whole model. (The direction of relationship, called "effect" here, is also displayed in the form of plus and minus signs.)

TABLE 18. NURSING PROGRAM OUTCOME MODELS -- SUMMARY OF ANALYSIS OF VARIANCE RESULTS

	Model A		Model B		Model B'		Model C		Model C'	
Main Effects Variables	(Effct)/ % Var Ex Studying Major		(Effct)/ % Var Ex Nursing A.A.-1		(Effct)/ % Var Ex Nursing A.A.-2		(Effct)/ % Var Ex 1st Pass NCLEX-3		(Effct)/ % Var Ex 1st Pass NCLEX-4	
ANOVA Tests*										
White	(+)	7.4	(+)	4.8		--	(+)	8.7	(+)	17.3
Older Student		--		--		--	(+)	4.3	(+)	8.6
Fulltime	(+)	7.4	(+)	10.5	(+)	12.6		--		--
Long Study		--	(+)	12.8	(+)	13.4		--		--
Oth College	(+)	2.1		--		--		--		--
Gen GPA		--	(+)	1.9	(+)	2.3	(+)	6.5	(+)	15.5
Devl Crs 1+	(-)	1.1	(-)	1.3	(-)	2.0		--		--
Devl Math		--		--		--	(-)	7.9	(-)	3.2
A&S Crs 2+	(-)	13.9		--		--		--		--
TOT VARIANCE EXPLAINED		31.9		31.3		30.2		27.5		44.5

* Standard Analysis of Variance, main effects only.
1- White var included 3- Dichotomous dependent var (n=237)
2- White var excluded 4- Raw Score dependent var (n=158)

Column A models the Studying Major outcome which includes five variables (total variance explained 31.9 percent):

A&S Course-Taking	(-)	13.9	Other College	(+)	2.1
Full-Time Study	(+)	7.4	Devl Course-Taking	(-)	1.1
Race/White	(+)	7.4			

Above average enrollment in number of humanities and social science courses proves to be the single strongest element of the Studying Major model, given a percent variance explained (PVE) figure of 13.9, almost twice as high as the next. The more A&S course students take prior to launching into nursing study, the less likely will be that launching. Unfortunately, as we have already remarked, the variable's timing and therefore its meaning is highly ambiguous -- does attending a lot of A&S courses tend to divert Unbegun Nursing Majors from nursing study or do Unbegun Nursing Majors tend to take a lot of such courses because they have already turned away from nursing study? More research has to be done before this question can be cleared up.

The next weightiest element of Model A is Full-Time as opposed to Part-Time study (7.4 PVE); one might argue that taken together with Other College Experience (2.1 PVE) a kind of "I (now) know where I'm going" factor is formed explaining almost 10 percent of the outcome variance. The implication is that having a sense of purpose and direction is as important lead into commitment to a study program like nursing.

Developmental Course-taking makes the Model A cut though just barely (1.1 PVE). While lack of academic preparation and the hurdle of remedial instruction do take their toll on would-be nursing students, apparently these are relatively minor deterents to nursing study over all. Much more important is Race which shows an irreducible 7.4 PVE impact on Studying Major conversion.

Column B models the Nursing Graduation outcome which also includes five variables (total variance explained 31.3 percent):

Long Time Study	(+)	12.8	High General G.P.A.	(+)	1.9
Full-Time Study	(+)	10.5	Devl Course-Taking	(-)	1.3
Race/White	(+)	4.8			

With two exceptions, this is the same list in variable inclusion and weight as we saw emerging from consideration of the raw Nursing Graduation correlations. The first exception is the absence of Non-Citizenship. There were simply too few foreign nursing majors at PGCC to make a dent in the total Nursing Graduation variance, despite the strength of the relationship within this tiny group.

The other exception is far more important. In raw correlation terms, the Race/White factor was far more impressive than it appears here represented by a relatively small PVE of 4.8. This weight looks feather-light compared with the combined over 23 percent variance explained by the two effort variables -- Duration of Nursing Study (12.8 PVE) and Full-Time Study (10.5 PVE). In fact, if the purpose of the analysis is shifted from creating maximally explanatory models (discerning causal structures) to generating merely highly predictive ones, then the Race variable is not strictly needed. Model B' tests the effect of removing Race from the original B Model, and reveals that it is minimal. The variant model's total PVE is only 1.1 percent less than that of Model B. In any case, the true story found in Model B is the overwhelming importance of plain effort in procuring a nursing degree at PGCC. Three out of four Nursing A.A. explanatory points contributed by the model derive from the two effort variables.

Column C models the NCLEX Passing outcome which includes only four variables (total variance explained 27.5 percent):

Race/White	(+)	8.7	High General G.P.A.	(+)	6.5
Devl Math-taking	(-)	7.9	Older Students	(+)	4.3

The main lesson to be derived from Model C, as we tentatively posited based on raw correlations, is that NCLEX performance heavily depends upon past college academic performance. Collectively, shaky math skills (7.9 PVE) and good grades (6.5) account for over half of all model-explained NCLEX Passing variance. But Model C allows the addition of a corollary to this basic insight: adequate preparation in mathematics is the single most important academic element in determining NCLEX outcome.

The relative importance of student age in NCLEX performance is the entirely new and unanticipated finding to emerge from the creation of Model C (Age/Older Student PVE = 4.3). The raw NCLEX correlation turned up hardly a hint that this might be true (delta = +6 only); the importance of the Age variable uncovered through ANOVA testing was almost totally masked by the stronger surface effects of other factors. Age seems to be operative in a definite but indirect fashion, interacting with other variables to amplify or diminish their impacts. For example, The simple NCLEX delta for Race is +23, but when Race is crossed with Age the following deltas are obtained: Young/Race = +7, Older/Race = +36. This is the basic pattern. Younger NCLEX takers show more solidarity and break less on other variables when it comes to exam success; among Older NCLEX takers, the examination effects of other forces are enhanced. In our data, both younger whites and non-whites fall towards the middle in NCLEX performance (78 and 72 percent passing, respectively), while older whites occupied the performance peak (99 percent passing) and older non-whites the nadir (62 percent passing).

Which partly anticipates Model C's last finding -- Race is the single most important predictor of recent PGCC nursing graduate success on the NCLEX (8.6 PVE). This is in striking contrast to the Nursing Graduation case, where the initial finding of extraordinary Race impact did not survive ANOVA testing. In the NCLEX case, no matter what statistical controls were introduced, the Race factor remained as the predominant outcome determinant. Not even taking into account prior correlations of Race with other variables like course grade performance and level of pre-college academic preparation could shake this finding. Why this should be so cannot be determined from the data at hand, and is well worth further research. For the moment, we are left only with speculations, perhaps the most likely of which is that there may be something to the growing suspicion among many in the nursing community concerning possible inadvertent cultural bias in the structure and language of the NCLEX itself. By itself, our study would be a "weak reed" to build an entire case on, but it is another "straw in the wind."

The issue is a vital one for PGCC's nursing program. Though its performance may be considered adequate or better than adequate in most areas, the one truly worrisome area is the NCLEX performance of its graduates of late. And performance has declined over the same recent years which have been showing simultaneous growth in the proportion of non-white nursing majors, including older non-white nursing majors who manifest the greatest difficulty in handling the NCLEX and who have increased from 20 percent of all nursing majors before 1979 to 30 percent 1984-1989.

Our Column C findings suggest that the PGCC Nursing Program is on the right track to promoting better NCLEX performance in its recent serious attempts to enhance the biology and other components of its instructional base for improved nurse training [A'Hearn & Basili/1989] and in its work in helping its students overcome prior educational deficit by revising its entry mathematics requirements and establishing projects like NEPP. The data do indicate that regardless of racial background, the better course trained are our graduates the better they perform on the NCLEX and the poorer their early academic ability, especially in mathematics, the lower their chances of licensing.

But what the program can do about the race factor <u>per se</u> is difficult to say. PGCC is a public open-enrollment institution with the mission of serving the educational needs of a county which happens to have a growing majority non-white population. This means that as a matter of course a non-white nursing student majority and an increasing one, which makes the PGCC nursing student body exceptional compared with that of its institutional peers in Maryland and across the nation where typically whites dominate. It also implies that so long as NCLEX performance remains race-linked in a way independent of somewhat controllable factors like amount and quality of student learning, PGCC nursing

graduate performance will appear relatively poor. If the link is forged in the NCLEX itself by some hidden cultural bias, then the problem ultimately can be solved only by the powers that be, and not by our program.

On the other hand, there may be "meanwhile" steps the program can take to mitigate this situation. First, it might try to discover new ways to help minority students identify and deal with white majority-oriented exam material and structures should any exist in the NCLEX. Second and perhaps more importantly, it might focus its extra efforts on older non-white students, because our data strongly suggest that younger non-whites in the program tend to approach white student NCLEX performance norms, all things being equal, while it is the older non-white who truly tend to lag behind.

Finally in this NCLEX outcome section, we may compare the results of our study with those of researchers from other higher educational institutions who have investigated the correlates of nursing graduate licensing success. There exists a reasonably large literature with this concern (see Appendix Reference Table), but several caveats are in order before we can begin comparison of findings. First, only one of the published research came out of a community college setting; the remainder were conducted at mostly Midwestern universities and four-year colleges using graduates of Bachelor of Science in Nursing programs as subjects. Second, not one of the study graduate samples contained analyzable numbers of non-white students, except for one which focused on black graduates to the exclusion of all others [Outtz/1979]. Third, with two exceptions [Whitly/1986; Woodham/1986], all of the studies dealt not with the NCLEX but with its predecessor -- the State Board Test Pool Examination (SBTPE). Fourth, our study was the only one founded on the ANOVA method; all the rest employed multiple regression analysis, which is similar in its mathematical underpinnings but which has a different research goal (prediction rather than explanation), and which tends to produce slightly different results in model variable-inclusion given the same data.

With all of the above divergences from our own work, nevertheless the literature review revealed that our study's findings were not out of line with those given by previous researchers on the subject. For example, all of the studies covered turned up significant correlations between licensing test success and college course performance measures like cumulative GPA. One research project confirmed our specific finding that General GPA is more strongly predictive of licensing test performance than Nursing Course G.P.A. [Seither/1980], two others found little difference between them as predictors [Perez/1977; Whitly/1986], while a fourth reversed their precedence [Yocum/1985]. Most of them also tested a range of other specialized course performance scales, particular measuring natural science performance as a predictor of licensing success, with much contradictory result.

The four-year college study [Perez/1977] showed unambiguously good predictive results from a measure based on social science course performance, which runs somewhat counter to our null-finding for A&S course-taking's impact on NCLEX performance.

Prior academic preparation was also featured by all studies, although measured in an extreme variety of ways (SAT scores, remedial course placement scores, high school course performance, etc.). It too was found significantly correlated with licensing test performance. Most researchers found poor English language skills a hinderance to license exam passing, as did we, but opinion differed on the impact of poor math skills which we found highly significant. The Northwestern University project agreed with us [Whitly/1986], the Indiana University project did not [Woodham/1986]. Lastly, little use was made of demographic variables in the research reviewed; mostly, our findings here stand alone, as do those on Study Time and Duration which were also ignored except in one inclusive case [Yocum/1985].

The Reliability of Study Outcome Findings. The decision to employ ANOVA as the methodological basis of this study stemmed from the desire to utilize the most powerful explanatory statistical technique available. Our main goal was to x-ray the structure of causality determining nursing program outcomes; the mere generation of predictive equations, however accurate, could not give us what is critical -- the understanding of the whole pattern of program success and failure necessary in strategizing future improvements. Other statistical approaches would have been more strictly appropriate given the nature of our data [Yocum/1987], but none of those could have readily taken us beyond prediction into explanation. Only ANOVA could do so. Thus, despite certain costs in accuracy lost and risk of unreliability run to which we alluded earlier, we opted for analysis of variance. But cognizant of these loses and risks, we also decided to attempt an indirect validation of our ANOVA-based findings by re-running the data using alternate methods and then comparing these results for compatibility with and confirmation of the original results.

The last column on Table 18 presents the C' Model of NCLEX outcome. Model C' was created not so much to test for an alternative to Model C as it was to provide a hint of how much stronger Model C (and by implication also Models A and B) might have been had we available to us better data. Our study's main methodological problem has been the restriction to entirely category-level data, on both the causal variable and outcome variable sides of the equation. As we already explained, we manoeuvred around this difficulty by converting all variables into binary scales (losing data power in the process) so that ANOVA which requires integer scales could be utilized. But we mentioned at the time that one consequence inevitably would be an artifactual deflation of impact estimates. That is, the correlations thus

obtained between causal variable and outcome would tend to underrate the actual strength of relationship. (Indeed, had we data all at the integer level or better in the first place, superb results might have followed, but institutional researchers will always be stuck with predominantly category-level variables.)

This hypothesis was actually testable in one instance, and that test is Model C'. For a sub-set (164) of the 237 graduates in our NCLEX sample, performance data was available in integer (raw score) rather dichotomous (pass/fail) form. (Prior to 1989, full NCLEX result were published; the sub-sample members were all 1987-88 test-takers.) Thus, although the causal side of the analysis of variance still involved only a binary scale, the outcome side for the sub-sample was measured in a thoroughly integer fashion. As can be readily seen, Model C' compared to Model C produces far more satisfactory results. The individual variable PVEs (except for Developmental Math-taking) more than double in strength, and the total model PVE goes from less than 30 percent to almost 45 percent, a quite respectable proportion in any sort of social research. Something like this probably would also occur to the now relative slight total PVEs of Model A and B had we integer measures of Studying Major and Nursing Graduate conversion, but alas these two outcome variables are conceptually restricted to dichotomous form (converted/unconverted).

Our second reliability test involved applying a method known as category modelling analysis (CATMOD) or analysis of Chi-square to the data for all three outcomes. CATMOD is directly analogous to ANOVA and can be thought of as the analysis of category-level variance. Why then did we not use CATMOD in the first place, since our data was all of this type and CATMOD was specifically designed to deal with such instances? The reason is that CATMOD yields nothing like PVE measures of individual variable and total model impact which can be unambiguously compared across a series of models. Instead, CATMOD provides estimates of "partitions of Chi-square" and total Chi-square which are very difficult to interpret in multi-variable cases and subtly vary in meaning given case differences in such things as "marginal distributions" (total column and row sub-sample sizes and proportions). As a supplement to and check against ANOVA applied to binary data, however, CATMOD is useful. The upshot is that our CATMOD analysis produced three outcome models which in all broad contours and in most proportional details corroborated the patterns embedded in ANOVA outcome models A, B and C. (See Appendix for a table which displays full CATMOD model results.)

The third and last reliability check involved applying a method known as discriminant function analysis (DFA). Unlike ANOVA (or for that matter CATMOD) but like multiple regression, DFA's purpose is simply the generation of predictive equations. The functions produced by techniques like multiple regression and DFA can be examined for explanatory meaning and often are so used, but

by design fortune-telling is the real point -- using past trends, mathematically expressed in formulas, to project future outcomes. DFA can be thought of as multiple regression using category variables. In DFA, the predicted variable is always of the category type (e.g., pass/fail) and a formula or "discriminant function" works in all of the causal variables (integer scales) used to describe a population, converting population known or estimated population values into probabilities of placement into the first, second or nth category of the outcome variable -- highest probability wins. DFA is not much used in social science or educational research but it is a prime tool in marketing research were outcomes of interest are naturally categorical (e.g., Brand X purchase/Brand Y purchase) and where the premium is put on anticipating, not understanding, consumer behavior.

Adopting the marketing outlook for the moment, could it not be said that one quite reasonable test of the validity of any model's ability to capture a phenomenon in microcosm is the ability of that model to make accurate determinations of the empirical behavior of that phenomenon? In other words, if it can be well predicted, then it is well modelled. There are very real research dangers, of course, in such "black box" thinking, but used as the basis of a secondary test of findings derived by more careful means it has its place. Our last reliability test took advantage of these assumptions. We generated a discriminant function out of the causal variables of each PGCC nursing program outcome model, predicted the outcome placement of our sample members and then compared that predicted placement with the known placement. The results are that in each outcome case, we accurately predicted the placement of over 70 percent of our sample members, results at least 44 percent better than random guessing in two-category cases:

Percent Properly Classified

DF Model for:	NO	YES	TOTAL	(Base)
Studying Major (A)	74	74	74	(5241)
Nursing A.A. Grad. (B)	74	74	74	(2196)
Nursing A.A. Grad. (B')	69	78	74	(2196)
NCLEX 1st Time Pass (C)	65	79	76	(237)

Executive Summary and Conclusions

This report has covered a wide variety of PGCC nursing program issues and generated a comprehensive set of empirical findings on program performance. In this final section, we would like to gather together in summary form the substantive results of our

study.

1. In numerical terms, the nursing program at Prince George's Community program is extremely healthy. Nursing enrollment and nursing course credit hour totals are among the six highest of the College's more than thirty instructional programs and curricula; moreover both are experiencing exceptional growth at a time when College enrollment and credit-hour generation is declining over all. The shear size of the PGCC nursing program is also impressive compared with those of other state community colleges. PGCC's is the largest in Maryland, training almost one in every eight two-year program nursing majors.

2. Compared demographically with PGCC's credit student body as a whole, the nursing program's segment is disproportionately female, older (26 years plus), married, foreign and non-white, and with the exception of gender, these attributes are the result of long term and continuing trends.

3. The most distinctive characteristic of the nursing student body is the predomination of non-whites (seven out of ten). In the last five years minority enrollment in the nursing program has been an accelerating trend paralleling and surpassing the whole College trend. The result has been to place PGCC's nursing program in an almost demographically unique position. None of the other community college nursing programs in Maryland, and few in the nation, are "majority minority" or even close.

4. Compared academically with PGCC's credit student body as a whole, the nursing program's segment is disproportionately part-time (approaching 100 percent in recent years, partly a function of changes in counselling policy) and non-PGCC college experienced. Nursing major all-courses grade performance is high (about .50 better in general cumulative GPA), and nursing major term-to-term retention rate is also superior.

5. The single most striking academic finding of the study is that fully one-half of all students since 1968 who are officially recorded as "nursing major" in fact never attempted a single nursing course. Put another way, only 50 percent of all declared nursing majors turned out upon examination (the taking of either of two entry-level nursing courses) to be genuine nursing students. This raises two unanticipated issues: (a) level of program performance in "occupational interest" retention; (b) reform of program performance measures (use of "studying major" rather than "declared major" as the base for graduation rate calculations, etc.).

6. Analysis of PGCC nursing program success focused on Studying Major, Nursing Graduate and NCLEX Passing outcomes and their rates. The analysis aimed at producing the fairest, most accurate and realistic conversion estimates by taking into account

long-term trends, estimator instability of the most recent data, the clarity provided by cohort analysis and variant results given alternative calculation bases (declared vs. studying major). The following best "recent years" estimates were obtained:

* Conversion to Studying Major - 50 % of Declared Majors

* Conversion to Nursing Graduate - 28 % of Declared Majors
  (56 % of Studying Majors)

* Conversion to Registered Nurse - 22 % of Declared Majors
  (44 % of Studying Majors)
  (80 % of Nursing A.A.s)

7. The PGCC Nursing A.A. graduation rate since the beginning of the last decade has been suffering a slight year-to-year decline (about - 2 percent); its first-time NCLEX pass rate actually increased for the first five years, but then dropped 20 points to a low of 68 percent in FY 1988-89. Partial FY 1989-90 data possibly but not certainly indicate the beginnings of a recovery (78 percent).

8. Comparison with peer institution data suggest (uncertain performance index) that our nursing program's 1984-88 A.A. graduation rate has been normal given its size, but that it lags marginally behind the mean rate for all Maryland community colleges; on the other hand its graduation rate decline over the last ten years appears to be less than the state community college average overall decline. Comparative first-time NCLEX passage statistics, however, show PGCC consistently at a disadvantage, school-to-school and year-to-year.

9. By means primarily of ANOVA, the study attempted to comprehend the structure of causality underlying the three nursing program outcome. Three outcome models were produced, all of which were found to be highly explanatory and moderately predictive of their respective type of nursing student progress. The three were (variables listed in order of impact):

* Model A (Studying Major Conversion) -- A&S Course-Taking, Full-Time Study, Race/White, Non-PGCC Experience, Developmental Course-taking.

* Model B (Nursing A.A. Conversion) -- Long-Time Study, Full-Time Study, Race/White, General GPA, Developmental Course-taking

* Model C (First-Time NCLEX Passage) - Race/White, Developmental Math Course-taking, General GPA, Age/Older.

10. Thus, the main underpinning of Studying Major conversion seems to be the maintenance of subject interest (as indicated by the predominance of the A&S Course-taking); however, the critical variable here is inherently ambiguous and the finding should be taken as strictly provisional. Otherwise, variables suggesting the importance of student purposefulness and clarity of direction dominate (Full-Time Study, Non-PGCC Experience). Less ambiguously, the thrust of the Nursing A.A. conversion model is dedication and perseverance (Long-Time Study, Full-Time Study). Also clear is the academic performance and readiness theme of the NCLEX passage model (Developmental Math Course-taking, GPA).

11. Just as important in all three of these models is the Race effect. Minority status was a debilitating factor in each conversion. However, it was the single most prominent factor in only the NCLEX passage case. The implication seemed to be that there may very well be something race-linked in the nature of the test instrument itself operating here. Also of interest was the way the Age variable cropped up, which further analysis showed functioned by interacting with Race. The effect was the suppression of passage differences among younger students and their exaggeration among older ones. Most at risk of any group proved to be non-whites over the age of 25.

In conclusion, we would like to emphasize the planning importance of the study's outcome findings. Further research needs to be carried out to pin down whether there truly is a loss-of-interest factor operating during the early phase of a nursing major's career at PGCC or whether we have turned up merely evidence of the long overlooked but normal shake-out of new student academic objectives. Concerning nursing graduation rates, the data show both strengths and weaknesses. Fortunately, this rate seems largely a function of factors over which the nursing program is capable exercising some influence -- amount and concentration of study. Also fortunately, its faculty and staff have already undertaken some recent steps in this direction, particularly in placing greater recent emphasis on student academic counselling and by inaugurating such study support projects as NEPP. Finally, concerning the performance area of least strength, the NCLEX -- the nursing program has already begun the process of the reform of the remedial education component (particularly regarding mathematics deficit) and enhancing the biology course component. Since NCLEX performance is so dependent on academic readiness, all of these moves are highly appropriate and should produce results. But as to the main negative correlate of NCLEX passage -- minority status -- this factor is beyond the nursing programs ability to control for its power in all likelihood lies in the examination itself.

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A P P E N D I X

APPENDIX TABLE I. Literature Citations & References

[JONE = Journal of Nursing Education]

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APPENDIX TABLE II. Nursing Program Outcomes by All Available Demographic and Academic Variables (Dichotomized Forms and Category % Breaks)

	% Nurs Course Takers	% Diff.	% Nurs A.A. Winners	% Diff.	% NCLEX 1st Time Passers	% Diff.
Females	54	+ 3	53	+ 11	79	- 12
Males	51		43		91	
White	66	+ 27	60	+ 24	89	+ 24
Non-White	39		37		65	
26 Yrs Old +	58	+ 11	56	+ 8	82	+ 6
< 26 Yrs	48		48		76	
Married	58	+ 7	59	+ 12	84	+ 9
Single	51		47		76	
US Citizen	55	+ 14	54	+ 19	80	+ 22
Non-Citizen	41		35		58	
Full Time	88	+ 42	83	+ 43	88	+ 13
Part Time	46		40		76	
Study 2.5 Yrs +	100	Inap	67	+ 29	77	- 12
< 2.5 Yrs Study	100		38		89	
Oth College Expr	63	+ 16	55	+ 4	82	+ 5
PGCC Exper Only	47		51		77	
Gen GPA 2.75 +	70	+ 8	65	+ 17	97	+ 30
< 2.75	62		48		67	
Nurs GPA 2.75 +	100	Inap	78	+ 15	95	+ 26
< 2.75	100		63		70	
Devl Crs: None	64	+ 25	58	+ 18	87*	+ 31*
At least 1	38		39		56*	
A&S Crs: < 2	76	+ 35	53	+ 1	83	+ 6
2 or More	41		52		78	
ALL STUDENTS IN OUTCOME BASE	54	[5241]	53	[2815]	79	[237]

* Developmental Math course-taking substituted

APPENDIX TABLE III. Dichotomized Variables Used in All Nursing Program Outcome Analyses by Category Percentages and Base Headcounts

	% All Majors	Base	% All Crs Tak	Base	% NCLEX Sample	Base
Females	92	(5241)	93	(2815)	95	(237)
Males	8		8		5	
White	55	(5241)	67	(2815)	59	(237)
Non-White	45		33		41	
26 Yrs Old +	49	(4949)	54	(2625)	60	(237)
< 26 Yrs	51		46		40	
Married	42	(5241)	45	(2815)	43	(237)
Single	58		55		57	
US Citizen	94	(5241)	95	(2815)	95	(237)
Non-Citizen	6		5		5	
Full Time	19	(5241)	30	(2815)	29	(237)
Part Time	81		70		71	
Study 2.5 Yrs +	52	(2461)	52	(2461)	85	(234)
< 2.5 Yrs Study	48		48		15	
Oth College Expr	41	(5241)	48	(2815)	46	(237)
PGCC Exper Only	59		51		54	
Gen GPA 2.75 +	39	(4123)	41	(2683)	41	(237)
< 2.75	61		59		59	
Nurs GPA 2.75 +	42	(2144)	42	(2129)	37	(237)
< 2.75	58		58		63	
Devl Crs: None	61	(5241)	72	(2815)	75*	(237)*
At least 1	39		28		25*	
A&S Crs: < 2	37	(5241)	48	(2815)	68	(237)
2 or More	63		52		32	
ALL STUDENTS IN OUTCOME BASE	100	[5241]	100	[2815]	100	[237]

* Developmental Math course-taking substituted

APPENDIX TABLE IV. **Nursing Program Outcome Models -- Summary of Analysis of Chi-Square Analysis**

(Category Modelling)

Main Effects Variables	Chi-Sqr/ (Prop Idx) Taking Nur Crs	Chi-Sqr/ (Prop Idx) Winning Nur AA-1	Chi-Sqr/ (Prop Idx) Winning Nur AA-2	Chi-Sqr/ (Prop Idx) 1st Pass NCLEX
White	111 (.09)	30 (.05)	--	3.6 (.13)
Age 26+ Yrs	--	--	--	4.0 (.15)
Fulltime	305 (.24)	249 (.45)	268 (.46)	--
Sem Study 2.5+	--	226 (.40)	229 (.39)	--
Oth College	159 (.13)	--	--	--
Gen GPA 2.75+	--	40 (.07)	60 (.10)	11.0 (.40)
Devl Crs 1+	66 (.05)	15 (.03)	30 (.05)	--
Devl Math	--	--	--	8.6 (.32)
A&S Crs 2+	627 (.49)	--	--	--
TOT CHI-SQRE AMONG VARS	1268	559	587	27.2
INTERCEPT/RES	490	113	118	51.6
TOTAL CHI-SQR	1758	672	705	78.8

NOTE: Column figures outside parentheses are chi-squares contributed by each variable to the model's total chi-square; those in parethesis are values of the "Proportion Index" and equal variable chi-square divided by model all-variable chi-square; intercept and residedual chi-squares represent total chi-square variation unaccounted for by the model.

1,2 - See footnotes to Table 18.

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